

mechanical

AUTOMOTIVE INDUSTRIES

LAND — AIR — WATER

FEBRUARY 19, 1938

WHAT MAKES A MOTORIST A "ONE CAR MAN"?



...One outstanding quality—*performance*. Eye-appeal, interior appointments and other more or less superficial features wield their important influence on sales from year to year, but only performance can command constant loyalty in any price class.

Superior performance in modern automobiles is the sum total of many contributing factors. Among the most valuable of these—as lead-

ing car manufacturers have definitely proved—are TIMKEN Tapered Roller Bearings... because TIMKEN Bearings are themselves manufactured to the highest standard of performance prevailing in the bearing industry—and have been for 40 years. The more TIMKEN Bearings there are in any automobile the greater its efficiency, dependability, economy, and safety—and the more complete its acceptance by the buyer.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; Timken Rock Bits; and Timken Fuel Injection Equipment.

TIMKEN

TAPERED ROLLER BEARINGS

VAST
TITANIC
STUPENDOUS

IMMENSE
COLOSSAL
GIGANTIC



• It's easy to go HOLLYWOOD over our new Bulletin 7322 Thermal Overload Relay! • Pictured above full size, it's probably the largest Thermal Overload Relay made ... made out size purposely ... to provide at least 50% greater electrical clearances than required by Standard Specifications. • And it's a giant for work, too. • Longer starting time with given current inrush ... silver to silver contacts ... vibration proof ... easily determined heater ratings ... quick break tripping ... no reset problem ... protection against stray air currents ... heavy molded base ... these and other features are designed and built into this Relay to give you trouble-proof motor protection and service.

Our nearest office will gladly supply you with further details.



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AUTOMOTIVE INDUSTRIES

THE AUTOMOBILE

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Published Weekly

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Number 8

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February 19, 1938

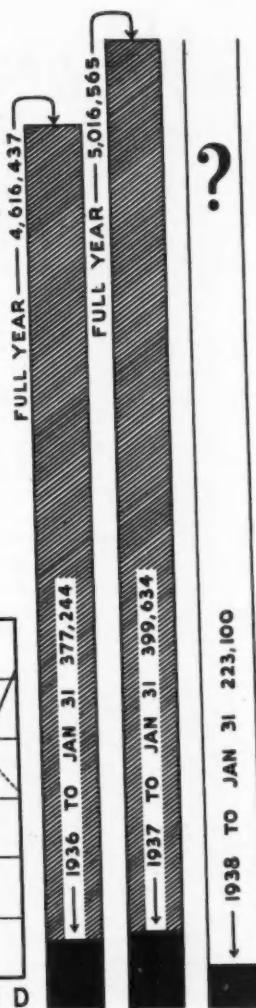
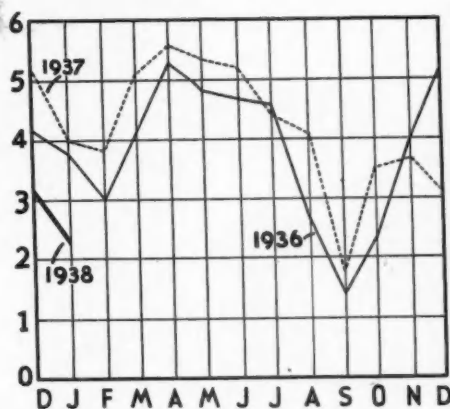
(Advertisement)

AUTOMOTIVE PRODUCTION*

Passenger Cars and Trucks
—U. S. and Canada

Bar charts at the right represent total production to Jan. 31st of year indicated.

Numbers at left of monthly graph below show production in 100,000's.



*From Department of Commerce Report and Automobile Manufacturers' Ass'n.

Ideas in Zinc

To the trained observer of things automotive, the real worth of an automobile depends upon the conception and execution of "hidden" details of construction. True it is that eye-appeal must be there to make the original sale of the car, but in the final analysis the performance and serviceability depend upon details that can't be seen—details that a buyer takes for granted.

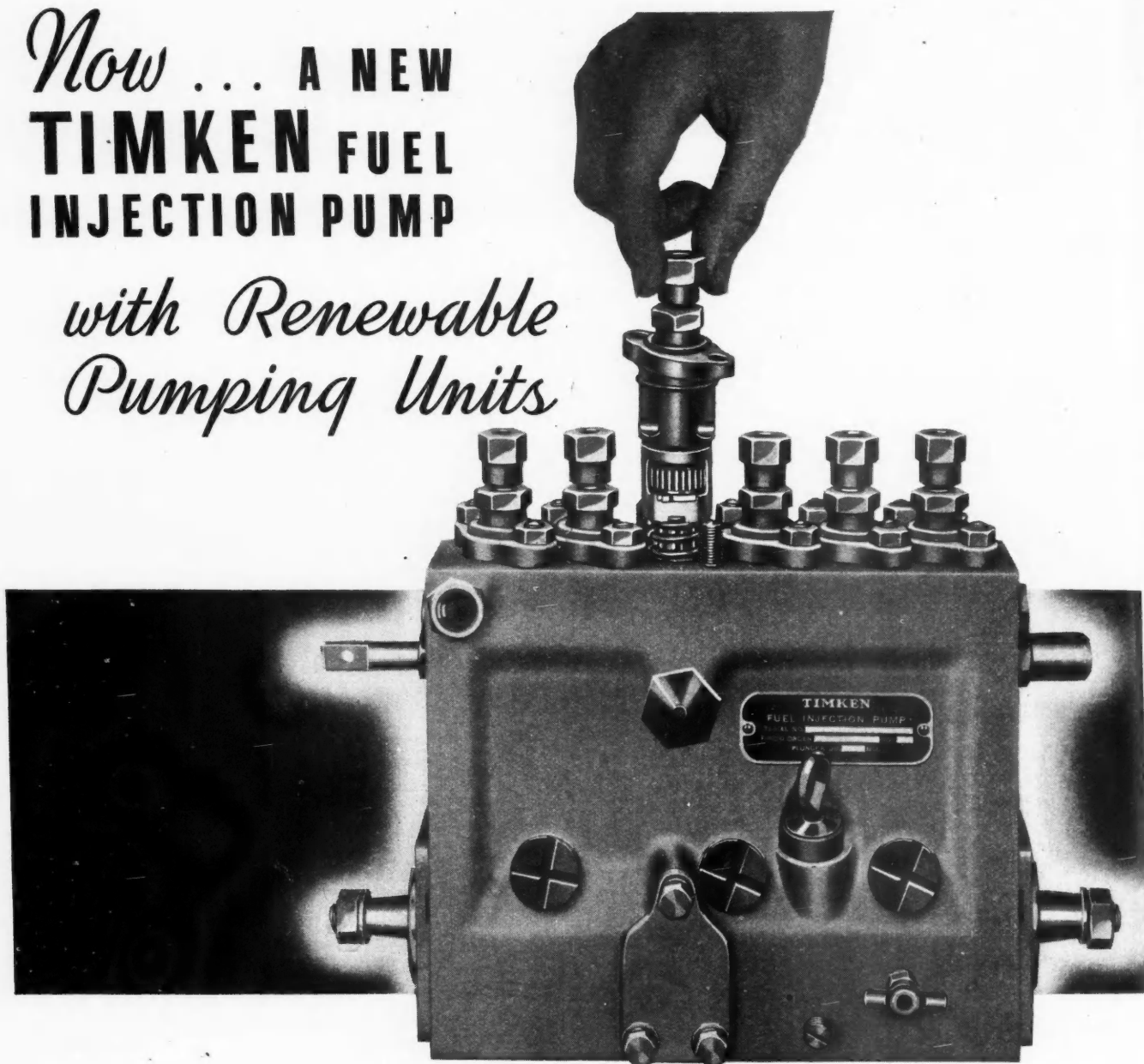
One of the most striking examples of this is a zinc alloy die casting developed for 1938 production by A. C. Spark Plug Company. Buried in grease in the steering column housing is a casting of semi-cylindrical form with eccentric bushings fitted at each end. It serves as the mounting for the steering gear worm which is carried in ball bearings in the eccentric bushings. The function of the eccentrics is to provide a quick adjustment for taking up worm wear or clearance in the mechanism due to any cause.

This housing replaces a former design which incorporated the use of a formed sheet metal mounting. Obviously the new part relies upon the unique merits of the modern zinc alloys by way of mechanical strength and stability, both in form and dimensions, under exacting service conditions. Much of the success of this application may be attributed to the development of the high strength, stable Zamak Alloys based on Horse Head Special Zinc of 99.99+ per cent purity. The New Jersey Zinc Company, 160 Front Street, New York City.

Idea No. 10

Now ... A NEW TIMKEN FUEL INJECTION PUMP

*with Renewable
Pumping Units*



TIMKEN Fuel Injection Equipment already has gained a nation-wide reputation for outstanding performance and economy. Now we bring to operators of compression-ignition engines another big advantage—a fuel injection pump that can be kept in top-notch operating condition at all times *without being removed from the engine!* In this new pump the pumping mechanism for each engine cylinder is a compact, self-contained unit. Any individual pumping unit

can be removed and replaced independently of the others. Thus, in case replacement is necessary there is no long delay while a complete new pump is obtained or the old one repaired. Instead, the pumping unit is simply slipped out of the pump body and a new one slipped in—a matter of minutes. Every engine operator will appreciate the value of this great time and money saving feature. Write for further information, mentioning the make, model and horsepower of your engine.

THE TIMKEN ROLLER BEARING
COMPANY, CANTON, OHIO

TIMKEN

FUEL INJECTION EQUIPMENT

February 19, 1938

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AUTOMOTIVE INDUSTRIES

Labor

UAW Extends Use of Mass Meetings To Further Organizational Efforts

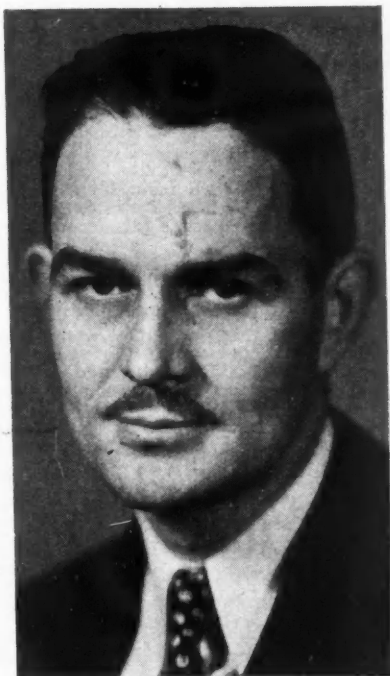
United Automobile Workers unions continued to depend upon mass meetings during the past week as a means of voicing demands for more relief appropriations and WPA jobs as well as in furtherance of their efforts to organize Ford Motor Co. employees.

At Flint, on Feb. 12, a crowd estimated at 7500 filled the Industrial Mutual Association auditorium in celebration of the conclusion of the General Motors strike a year ago to hear Homer Martin, UAW president, and a long list of CIO leaders. The crowd included delegations from UAW locals in Detroit, Pontiac, Saginaw and Lansing.

In Dearborn last Sunday the UAW sponsored a mass meeting in the Fordson high school auditorium, gymnasium and the auditorium of another school. Attendance in the three halls varied from an estimate of 3500, by newspapers, to 10,000 by union officials. Speakers included Homer Martin, Richard R. Frankenstein, director of the Ford drive, Joseph Schlossberg, secretary-treasurer of Amalgamated Clothing Workers, and Adolph Germer, CIO regional director.

With depleted revenues resulting from non-payment of dues by unemployed members, the union has been obliged to continue modification of its staff and to withdraw support from social organizations. Latest to suffer was the UAW medical research bureau when the UAW district council withdrew financial support this week after the executive committee had taken a similar step several weeks ago.

While no comment has been made by union officials, it is evident that membership mass meetings offer an economical means of maintaining membership morale and of furthering organizational activity. The union, to date, has declined to make
(Turn to page 223, please)



HARRY W. FRIER

... who has been appointed assistant advertising manager of the DeSoto Division of Chrysler Corp. Mr. Frier was formerly associated with the advertising agency of J. Stirling Getchell, Inc.

Chrysler Clarifies Dealer Contract

Policies and Principles Related to Factory-Dealer Relations Set Forth in New "Liberalized Sales Agreements"

Officials of the Chrysler Corp. announced this week that new "liberalized-sales agreements" are being offered to the entire domestic distributor and dealer organization representing all divisions of the corporation.

"The new agreement," according to a spokesman for the corporation, "substitutes a clear, easily understood document embodying the principles that have always guided the corporation in its relationships with its distributing organization and the public for the former legalistic document which frequently left a doubt in the minds of many dealers.

"The new agreement sets forth not only our mutual obligations," he said, "but what all good dealers realize

Production

Car and Truck Output Unchanged Pending Seasonal Sales Upturn

Awaiting the seasonal sales impetus that spring always has brought to the automotive business, the industry finished its third week in the current month with production holding even with that of the previous week, when it turned out approximately 54,000 cars and trucks.

If this pace is maintained next week the industry will exceed original forecasts of 200,000 units for the month by a slight margin, while no great increase is needed to bring February's total to a par with January's production.

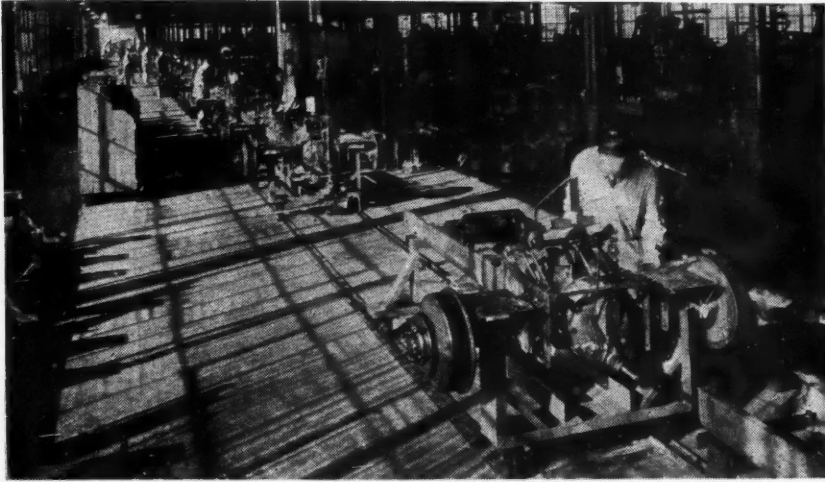
Resumption of production by two independent producers and a few scattered increases in other plants this week were largely offset by schedule modifications in the plants of other manufacturers, so that the total for the week, when final figures are in, will just about remain as they stood a week ago.

Encouraging news on dealers sales
(Turn to page 223, please)

as their obligations to each other as responsible business men in their own communities. It is an attempt to write a fresh understanding between dealers and corporation regarding the basis on which they will do business together.

"It begins with an acknowledgment that the corporation and the distributor are dependent upon a continuing good will on the part of the public and that the success of each distributor is dependent upon the business conduct of all other distributors, particularly those in his immediate vicinity."

Policies and principles affecting orders for vehicles, parts and accessories, price protection, termination
(Turn to page 222, please)



2000 UNITS Interior view of Graham-Paige Motors Corp.'s new tractor assembly plant where a full-time crew is now turning out Graham-Bradley tractors to fill an order of 2000 units for Sears, Roebuck & Co. Scheduled for shipment this month are 650 of the jobs.

Graham engineers have made several improvements in the current production models as the result of carefully checking performance records of tractors in the hands of purchasers. Compression ratio has been increased from 5.15 to 1, to 6.15 to 1. The engine has been given more "lugging" power at slow speeds. Belt-pulley speed has been increased, gear

shifting is said to be easier, and the rear power take-off control has been lengthened to put it within reach from the driver's seat. Greater accessibility has been given the carburetor adjustment controls, and a change of the bell housing now permits the removal of the clutch for service work without disconnecting the engine.

Other improvements include a new placement of the air-intake which removes it from the top of the hood and conceals it behind the grille, and a new automatic crankcase ventilation system arranged so that air is prevented from reaching the carburetor or crankcase without first passing through the air filter.

Imagination Still Profitable

Says Chrysler's J. S. Thomas Addressing New York Advertising Club; Predicts New Products to Come from Research

Despite the amazing advances of technology, resulting from harnessing research to design and production problems, frontiers for conquest in this country are more numerous than ever before, according to Dr. James Shelby Thomas, president of Chrysler Institute of Engineering. He told the New York Advertising Club last week that "imagination is as profitable today as it ever was in history."

Only those who will believe that the future of America is more brilliant than the past will profit, he said, pointing out that "we are still pioneering in this country, and most of our problems arise from our inexperience." A constant danger, he believes, lies in the too-prevalent attitude that all that has been worth doing in management, invention, manufacture and sales has already been done.

Frank A. Conolly, chairman of the meeting, said that "anxious eyes of the business world are again turning to the automobile industry to lead us out of this business recession."

Doctor Thomas predicted many new products to come from the research laboratories of the automotive

and other industries. He envisioned glass and metals being synthesized from vegetables, and the discovering of heretofore unheard of combinations of alloys to take the place of present-day materials.

"The automobile industry considers anything two years old as archaic. The patent-pooling program of the automotive industry proves that the engineers in the workshops of the industry are less interested in the things of yesterday and today than in what tomorrow's research will unfold," he said.

Business men, he declared, constitute the "golden thread in the fabric of civilization," because they have paid for purely idealistic culture in the universities of the land through their donations.

Rims Inspections Off 75 Per Cent

Statistics released by the Tire and Rim Association show that the total number of rims inspected and approved during January, 1938, amounted to 527,899. Compared to the figure for January, 1937, of 2,123,723, this is a decrease of approximately 75 per cent.

Plant Notes

New Electric Arc Melting Furnace Installed in Smith Steel Foundry

Smith Steel Foundry Co., Milwaukee, formerly George H. Smith Steel Casting Co., is completing the installation of a new one-ton electric arc melting furnace, with auxiliary equipment, for the production of high alloy steel castings as an addition to its line of regular alloy products. According to Edward A. Bacon, president, a large share of the output of the new furnace will be stainless steels for heat and corrosion resisting purposes.

Gillette Rubber Co., Eau Claire, Wis., has completed a \$375,000 plant expansion program making possible a daily production capacity of 10,000 automobile tires, 15,000 to 18,000 inner tubes and 7000 to 8000 bicycle tires. In addition the concern has leased a large two-story factory building nearby from the McDonough Mfg. Co.

Glove Co., Sheboygan, Wis., manufacturer of general steel stampings, tools, jigs and dies, ceased manufacturing operations Feb. 1, and has engaged in negotiations for the sale of its plant, machinery and material inventories which are expected to insure retention of the industry for the city and resumption of production within a short time. An announcement by Fred Leicht, general manager, said: "The management deeply regrets that a step such as this has become necessary, but conditions allow no other procedure." This industry was established in 1917.

Fruehauf Trailer Co., Detroit, has increased the facilities of its Chicago plant with construction of a modern sales and service building
(Turn to page 229, please)

... slants

LODESTONE—According to Will Dammann, president of the Bear Mfg. Co., over 500 repair men enrolled in the Bear School at Rock Island, Ill., during 1937. The men came from not only the United States, but from such farflung places as New Zealand and South America. In addition to the record-breaking enrollment at the Bear School in Rock Island, other Bear Schools at Toronto, New York, Boston, Salisbury, N. C., Newark, Los Angeles, Portland, Ore., and Chicago also topped all previous attendance records.

Purpose of these free schools, explains Mr. Dammann, "is to meet the demand for trained mechanics who not only know how to operate wheel

alignment, frame and axle straightening, brake testing, headlight testing, and other safety and correction equipment, but also how to sell these services to the car owner."

NEW VS USED—Summary tabulations of 17,000 farm families in 64 counties made in 1935-1936 by the Bureau of Home Economics, U. S. Department of Agriculture, under the direction of Dr. Louise Stanley, show that farm families on the average buy almost twice as many used cars as new cars. Usually these are high-value used cars, although their cost averages only a little over one-third the cost of the new cars purchased.

Car ownership of all non-relief, native white farm families interviewed ranged as high as 97 per cent in California, North Dakota, and Kansas. In Vermont the percentage was 73. Car ownership the country over averaged a little more than 82 per cent.

Only in California did the white farm families studied purchase more new than used cars. In the group surveyed, an average of \$263 was paid for used cars and \$739 for new cars.

Motor Wheel Declares Dividend

The board of directors of the Motor Wheel Corp., Lansing, Mich., has declared a quarterly dividend of 20 cents per share on the common stock, payable March 10, 1938, to stockholders of record at the close of business Feb. 19, 1938. Net earnings for the year 1937 were \$1,795,143.13.

Canada's Automotive Situation 1928-1937

The following statistics on automobile production, imports, exports, apparent consumption, total registration, and apparent wastage in Canada for the years 1928-1937, inclusive, concern passenger cars only:

	Production	Imports	Exports	Apparent* Consumption	Total Registration	Apparent Wastage
1937.....	153,371	\$16,100	\$52,400	\$117,071	\$1,071,900	\$36,700
1936.....	128,369	8,053	42,351	94,071	1,041,529	43,700
1935.....	135,562	3,133	47,592	91,103	989,754	39,328
1934.....	92,647	1,988	31,274	63,361	952,427	26,034
1933.....	53,849	1,093	15,828	39,144	316,953	3,670
1932.....	50,694	1,160	9,800	42,054	945,355	70,456
1931.....	65,072	7,492	9,282	63,282	1,024,119	142,046
1930.....	121,337	19,683	28,841	112,179	1,047,494	135,544
1929.....	203,307	39,446	64,863	177,890	1,013,663	144,059
1928.....	197,848	40,226	55,732	182,342	921,395	90,074
				982,497		781,611

‡ Estimate.

* Includes small number of re-exports.

Hits "Dream" Highway Panacea

Connecticut's Senator Lonergan Ridicules Proposal for \$8,000,000,000 Self-Liquidating Building Program

Congressional enthusiasts of national super-highway networks are vying for the honor of being the first to propose a plan sound enough to make it a reality rather than a myth.

Senator Lonergan, Democrat, of Connecticut, ridiculed the idea of building "dream" highways overnight after Senator Bulkley, of Ohio, suggested an \$8,000,000,000 road building program which he promised could be completely self-liquidating.

Lonergan advanced a plan similar to Bulkley's several months ago and turned it over to the Bureau of Public Roads for study. Conferences with bureau officials convinced him, the Senator said, that "it is impos-

sible at this time to contemplate the immediate construction of transcontinental highways and expect them to be self-liquidating."

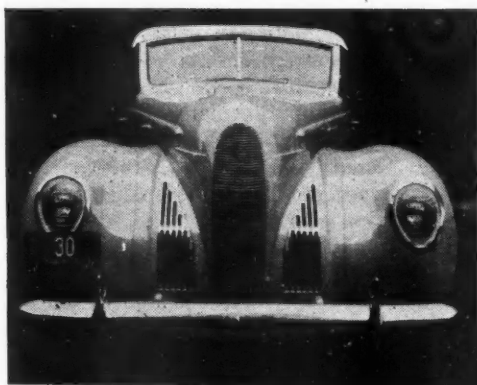
He announced plans to introduce a bill to establish a board within the Bureau of Public Roads whose job would be to direct a 20-year program for the construction of transcontinental highways, units of which would be designed for maximum road safety and financed by toll charges until the cost is liquidated.

A survey undertaken by the bureau indicates that "the actual need at present is for hundreds of small toll projects to take traffic around cities and to avoid railroad grade crossings while at the same time absorbing existing units of the public roads system which are of boulevard width and which comply with safety requirements," Lonergan said.

Further reflecting the attitude of the bureau, the Senator conceded that traffic volume west of Chicago does not tax existing roads except perhaps at cities where he said "toll bypasses could be erected as a start." He also recognized the high cost of obtaining rights-of-way, pointing out that it would absorb too much of the cost to undertake super-highways without absorbing parts of the regular public roads system.

He advanced the idea, however, that after directional routes were laid out by a planning agency, a method could be arrived at whereby States would grant rights-of-way or be required to use Federal highway or work relief funds for building roads connecting with the special highway system.

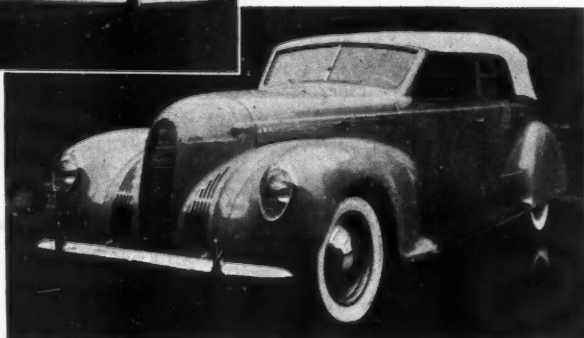
President Roosevelt said on Tuesday (Turn to page 229, please)



Using the standard big Lincoln chassis (145-in. wheelbase) and Lincoln convertible body, LeBaron built an entirely new front end, fenders, top, and interior.

IDEAS BY BRIGGS

An individually styled Lincoln built by the LeBaron Detroit Co. for J. H. Knox of Knox-Lacke Motors, Inc., Ford and Lincoln-Zephyr dealers in Buffalo, New York. The styling ideas emanated from the designing division of Briggs Mfg. Co., of which LeBaron is a subsidiary.





A. E. GRAPP was reelected president of the Despatch Oven Co., Minneapolis, Minn., at the annual meeting of the board of directors of that company held Feb. 1. Other officers who were reelected at the same time are: H. L. Grapp, vice-president and general manager; C. P. Doherty, vice-president and production manager; G. C. Keyes, vice-president and chief engineer; and F. H. Faber, secretary and sales manager.

E. V. OEHLER, vice-president and general sales manager of Briggs & Stratton Corp., Milwaukee, was elected president of the Automotive Electric Association at that organization's annual business meeting and distributors conference held in Detroit, Feb. 6 to 11. George J. Beattie, president of Auto Electric Service Co., Ltd., Toronto, was named vice-president of the distribution division; Frank B. Willis, vice-president and director of sales for Bendix Products Corp., was named vice-president of the manufacturers division; and George S. Cole, secretary and general manager of Leece-Neville Co., Cleveland, became secretary-treasurer.

WILLIAM F. O'NEIL has been reelected president and general manager of the General Tire & Rubber Co. Other officers also reelected include: W. E. Fouse, vice-president and secretary; C. J. Jahant, vice-president; T. Spencer Shore, treasurer; H. R. Jenkins, assistant secretary; and T. S. Clark, assistant treasurer. Directors reelected include: W. F. O'Neil, W. E. Fouse, C. J. Jahant, G. F. Burkhardt, and Charles Herberich, all of Akron; T. F. O'Neil, of Miami, Fla.; and J. R. Kraus, of Cleveland.

W. R. SPILLER, formerly chief engineer of the White Motor Co., is engaged in consulting work for the Erie Malleable Iron Co., Erie, Pa.

GEORGE A. SLOAN of New York City has been elected to membership on the board of directors of the Goodyear Tire & Rubber Co., Akron, to succeed the late Newton D. Baker.

J. E. DELONG, president of the Waukesha Motor Co., Waukesha, Wis., recently sailed from New York for a three months' voyage which will take him to five European countries.

W. H. WELCH, assistant director of service, Chrysler Export Division, has sailed for Europe where he will train service supervisors and distributor service managers in the operation of the service improvement and parts merchandising programs recently developed by Chrysler for operation in all overseas countries.

G. REED SCHREINER has been appointed advertising manager of the Carnegie-Illinois Steel Corp., succeeding Charles R. Moffatt, recently named director of advertising of the United States Steel Corp.

WILLIAM E. ENGLAND, who recently resigned as chief engineer of the Willys-Overland Co., Toledo, Ohio, has been appointed executive engineer for the American Bantam Car Co., Butler, Pa.

GERALD D. HOWK has been made mill representative in the Cincinnati territory for the Ludlum Steel Co., Watervliet, N. Y.

GEORGE H. JOHNSON, vice-president of the Gisholt Machine Co., Madison, Wis.; L. D. Harkrider, president of General Malleables Corp., Waukesha, Wis.; and Harold S. Falk, vice-president of the Falk Corp., Milwaukee, have been named by Governor Philip F. LaFollette of Wisconsin as members of the employers' committee established by the Wisconsin State Labor Relations Act.

MOXIE S. GEORGE, assistant district sales manager in the Milwaukee office of the Inland Steel Co., has been promoted to assistant sales manager of the company's flat rolled steel division in its general headquarters in Chicago, effective April 1.

PHIL HUBER, president and general manager of the Ex-Cell-O Corp., Detroit, has been chosen to serve as a director of the National Machine Tool Builders' Association to fill the vacancy created by the resignation of Newton A. Woodworth, formerly first vice-president of the Association. W. E. Whipp was unanimously elected first vice-president, succeeding Mr. Woodworth.

HERBERT L. CRAWFORD has joined the sales promotion staff of the Studebaker Corp.

Textite Offers Industrial Separator

A separator designed to remove water, oil, dirt, etc., from compressed air, gas, or steam in industrial installations, known as the Hager separator, is being manufactured by the Textite Corp., Chicago. It is suitable for pipe sizes up to $\frac{3}{4}$ in. and has a cleaning unit which is 6 in. in diameter, $10\frac{1}{2}$ in. long, and weighs $15\frac{1}{2}$ lb. The cleaning effect is due to linear deflection, jetting, centrifugal force, capillary attraction and sudden expansion.

Mounted one above the other in the separator are three vaned units, through which the air, gas or steam travels in succession before it leaves at the top connection. Each of these units sets up a rapid swirling motion in the gaseous medium as long as the latter passes through the separator. The whirling motion throws moisture and dirt outward from the axis. At the same time the flow is caught by additional sets of vanes curved in the opposite direction and secured to overlapping sleeve on the inside of the housing. The reversal following the centrifugal action causes the moisture and dirt to strike the inner surface of the cups, from where they drop to the collection chamber just inside the shell of the assembly.

This separator is being made with a tie-rod assembly of heads and shell, so the inside is easily accessible for examination. The metals used in its construction are rust-proofed and there are no moving parts.

Buick Sales Improve

Continued improvement in new and used car sales were reported this week by W. F. Hufstader, general sales manager of the Buick division of General Motors Corp., following compilation of sales statistics for the first 10 days of February.

Domestic retail deliveries of Buick motor cars during the period totaled 2860 units, Mr. Hufstader said, compared with 2587 in the first 10 days of January, a gain of 273 units or 10.5 per cent, and with 1791 in the first 10 days of February a year ago,

a gain of 1069 units or 59 per cent.

At the same time Buick dealers throughout the country showed a reduction in used car stocks with used car sales during the period totaling 8133 against 6053 in the first 10 days of January and 6986 in the corresponding period of February last year. On the basis of turnover of used cars during the past 30 days the total of stocks in the hands of dealers on Feb. 10 was estimated at 41.8 days' supply. This was virtually the same as a year ago when 42 days' supply was on hand.

Chrysler Contract

(Continued from page 219)

by either party, protection against cross-selling and bootlegging, changes in price, and other conditions which may arise in factory-dealer relationships are now clearly stated in the agreement in the belief that dealers will thereby know at all times what their obligations and rights are.

"For example," the spokesman pointed out, "it always has been our policy to ship cars and parts only on order from the dealer but now the new agreement expressly states that that is what we will do. Similarly the agreement now states specifically how every relationship between the corporation and its dealers will be handled."

Dodge Retail Deliveries Higher

An increase in retail deliveries of new passenger cars, commercial cars and trucks by Dodge dealers throughout the United States has been reported by A. vanDerZee, general sales manager of the Dodge division of Chrysler Corp.

During the week of Jan. 31, reports from the field, according to vanDerZee, "... show an increase in Dodge passenger car deliveries of 10.3 per cent; an increase in Plymouth passenger car deliveries through Dodge dealers of 11.5 per cent; an increase in Plymouth commercial car deliveries through Dodge dealers of 18.2 per cent; and an increase in Dodge truck deliveries of 10.2 per cent over the previous week.

"... Stocks of used cars and trucks in Dodge dealers' hands are lower by 9.5 per cent as compared with a year ago. Another satisfactory indication is found in a steady increase during the past three-week period in used truck deliveries by Dodge dealers over the same period of 1937."

Labor

(Continued from page 219)

any claims as to the number of Ford workers it has enrolled.

Negotiations for renewal of the UAW-Chrysler contract, which expires on March 31, may not get started for another month, it now appears. The union originally had suggested Feb. 15 as a starting date for discussions, but is said to have agreed to a postponement of about four weeks. E. L. Liddell, president of the independent association of Chrysler employees, has filed with the Chrysler Corp. a demand that the union be recognized as a bargaining agent for its members after the present contract between the company and the UAW expires.

The Wilson Foundry & Machine Co., Pontiac, which makes the engines for Willys, reopened this week following settlement of a strike called the previous week by UAW local 159 alleging violation of the union's contract with the company. Negotiations between the union and company officials resulted in satisfactory settlement.

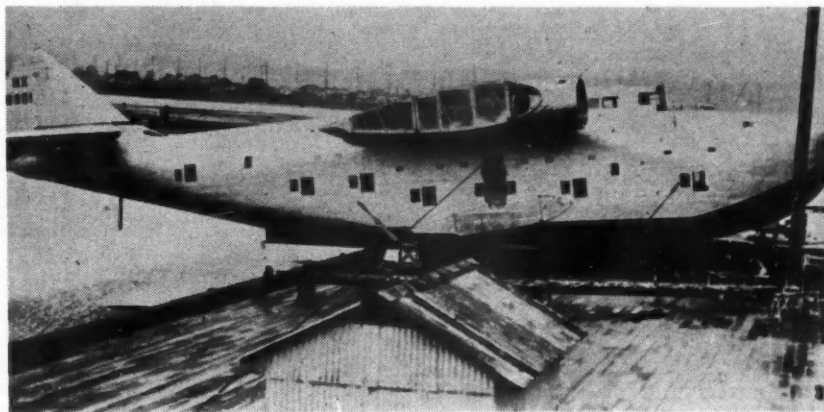
John D. McDowell, chairman of the Ford Brotherhood, Inc., branded a company union by the National Labor Relations Board, but disclaimed by the company, appeared to be a "man without a union," after he lost control of a meeting on Feb. 12 of 300 members, who voted to affiliate with the UAW.

McDowell, who claimed those attending were only a small part of the Brotherhood membership gathered to discuss unemployment problems, lost control of the meeting after he had introduced an AFL representative who told those present that the AFL is conducting a secret campaign to organize Ford workers. The meeting, however, voted to affiliate with the UAW, although R. W. Labar, attorney for the Brotherhood, advised that such a vote was illegal without consulting the rest of the membership, claimed to be 21,000.

Charles Denby

Charles Denby, one time vice-president of Hupp Motor Car Co., died in Washington, D. C., Feb. 15. He was a brother of the late Edwin Denby, Secretary of the Navy, and had himself been prominent in diplomatic circles from 1885 to 1915 when he joined Hupp.

Mr. Denby was second secretary of the U. S. Legation at Peking in 1885 and held various diplomatic posts in China.



WORLD'S LARGEST —

The 72-passenger clipper plane now being built by the Boeing Aircraft Co. for trans-Atlantic service was viewed by the public for the first time Feb. 13 when it was moved out onto a ramp at

the Seattle plant. This is the first of six such planes being built for Pan-American Airways.

The double-deck flying boat will weigh more than 42 tons. Its flying range is 4000 miles; cruising speed 200 m.p.h.

Approve Revised Withrow Resolution

House Committee Passes on Resolution Now Confined in Scope to Investigation by FTC of Alleged Monopolistic Practices

A revised Withrow resolution admitting allegations that manufacturers are "forcing the market," and confining the scope of the FTC's \$50,000 investigation to determining the extent to which price fixing and other alleged monopolistic practices are engaged in by automobile manufacturers, has been approved by the House Interstate and Foreign Commerce Committee.

The approved resolution embodies substantially all of the recommendations made by the Federal Trade Commission. A FTC spokesman recently expressed the view at a subcommittee hearing that the revisions suggested by the FTC had the same objectives as those proposed by the manufacturers.

The purpose of the resolution, as set forth in the approved text, is to determine:—

1. The extent of monopolistic, price fixing, and other unfair trade practices engaged in by manufacturers, and
2. The extent to which any of the anti-trust laws are being violated.

The Federal Trade Commission would report to Congress within one year with recommendations for remedial legislation if found necessary.

Prompt passage is expected in the House and there is reported to be considerable sentiment in the Senate Commerce Committee for authorizing the inquiry. That committee already has passed favorably on the Minton resolution.

The original Withrow resolution, similar to the Minton proposal,

made a number of allegations, including the charges that manufacturers' policies were responsible for unfair competitive methods among retailers; that there is a lack of sound contractual agreements between manufacturers and dealers, and that retailers are virtually insolvent as a result of demands made by manufacturers. All of these charges were dropped from the resolution at the request of the full committee.

Production

(Continued from page 219)

during the first 10 days of February are reported by factories who have completed their tabulations for this period, although the increase is largely seasonal and has not up to the present time been reflected sufficiently in commitments from dealers to affect production schedules.

Dealers and factories alike continue to draw encouragement from the results of intensive efforts to move used cars, with the ratio of used car sales to new car sales remaining above normal in most instances.

Hudson added a brougham to its list of the new 112 models this week, and announcement of the liberalized contract being offered to dealers representing all divisions of the Chrysler organization is expected to have a beneficial effect on the morale of this important sector of the retail automotive trade.—J. A. L.

Business in Brief

Written by the Guaranty Trust Co., New York

Developments last week were not very encouraging. The business index compiled by the *Journal of Commerce* continued to decline, standing at 69.5, as compared with 70.6 the week before and 96.3 a year earlier. The setback during the current week was due mostly to a reduction in steel output and automotive operations, although losses were also shown in petroleum runs to stills and electric output. There was a gain in the volume of retail trade, however, ranging from 2 to 8 per cent above the level in the preceding week.

The agreement between one large steel company and the Steel Workers Organizing Committee, has been continued, while prices have been reduced. It is pointed out by some that these steps indicate a continuation of the uncertainty of the industrial outlook on the part of the management.

Railway freight loadings during the week ended Feb. 5 amounted to 564,740 cars, which marks a gain of 11,564 cars above those in the preceding week, a decline of 106,487 cars below those a year ago, and a drop of 56,946 cars below those two years ago.

According to the Department of Commerce, commodity stocks de-

clined slightly in December. The index stood at 161.6, as compared with 162 for the preceding month. Although the decrease was small, it is significant in that it marks the first reduction since June, 1937, when the index stood at 99.0.

Production of electricity by the electric light and power industry in the United States during the week ended Feb. 5 was 5.4 per cent below that in the corresponding period last year.

Lumber production during the week ended Jan. 29 stood at 40 per cent of the 1929 weekly average. Production was at about the same level as in the preceding week, but both shipments and new business showed gains.

Professor Fisher's index of wholesale commodity prices during the week ended Feb. 12 stood at 82.4, as compared with 82.6 the week before and 83.1 two weeks before.

The consolidated statement of the Federal Reserve banks for the week ended Feb. 9 showed no changes in holdings of discounted bills, bills bought in the open market, and Government securities. Money in circulation declined \$17,000,000, and the monetary gold stock rose \$1,000,000.



A table listing the Norton abrasive wheels recommended for various types of foundry work will be found in a new pamphlet issued by the Norton Co., Worcester, Mass.*

Gallmeyer & Livingston Co., Grand Rapids, Mich., has brought out a new catalog describing its line of Grand Rapids surface grinders. Several of these machines have been recently improved in design including the No. 65, the No. 35, the No. 55, and the No. 38, hydraulic feed surface grinders.*

Portable hydraulic welding guns and equipment manufactured by the Progressive Welder Co., Detroit, are described in that company's latest bulletin, No. 3802.*

Construction details of F-M direct-current motors in their various sizes are described and illustrated in bulletin No. 2260 just issued by Fairbanks, Morse & Co., Chicago.*

Extended use for rubber through recent research developments are discussed in a paper "Rubber Manufacture—A Growing Industry," prepared by J. W. Schade, director of research, The B. F. Goodrich Co., Akron.**

Barber-Colman Co., Rockford, Ill., has brought out a pamphlet describing and illustrating its positive, adjustable, expansion reamer.*

"Natural Laws Applied to Production" is the title of a brochure designed to show how modern industrial organization is based on the principle of continuous flow. It has been published by the Mathews Conveyor Co., Ellwood City, Pa.

Variable speed reducers manufactured by the Stephens-Adamson Mfg. Co., Aurora, Ill., are described in catalog No. 68 just issued by the company.*

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

Cord Corp.'s Name Changed

At the annual meeting of Cord Corp. stockholders held recently, the name of the corporation was changed to the Aviation and Transportation Co. Authorized capital was reduced from \$10,000,000 to \$3,000,000 and the par value of the stock from \$5 to \$1 per share.

The following directors were elected: C. Coburn Darling, Gerald E. Donovan, Victor Emanuel, Tom M. Girdler, Henry Lockhart, Jr., L. B. Manning, and R. S. Pruitt.

Goodyear Lists Earnings

Net Profit for Year 1937
Totalled \$7,257,287

Goodyear Tire & Rubber Co., Akron, has reported that its net consolidated operating earnings for 1937 after all prior charges, including taxes, depreciation, and interest, but before adjustments, totaled \$17,600,029. After providing \$10,342,742 to reduce commitments, inventories of raw materials, and rubber and cotton content finished products to the lower figure of cost or market, net profit carried to earned surplus amounted to \$7,257,287.

Earnings, before adjustments, were equivalent to \$6.97 per share of common stock outstanding at the end of the year and \$1.94 per share of common stock after such inventory adjustments. The company's principal raw material, crude rubber, after selling for 20½ cents per lb. at the beginning of the year, rose to a high of 27 cents in the spring and then fell sharply in value to 14 9/16 cents per lb. on Dec. 31.

On Monday this week the board of directors declared the regular dividend of \$1.25 per share for the first quarter of 1938 on the company's \$5 convertible preferred stock. This dividend will be payable on March 15, 1938, to holders of record Feb. 25, 1938.

A dividend of 25 cents per share was voted on the company's common stock, payable March 15, 1938, to holders of record on Feb. 25, 1938.

Consolidated net sales of the Goodyear Tire & Rubber Co. and subsidiaries for 1937 totaled \$216,174,513. As compared to \$185,915,674 for the previous year, this is an increase of 16 per cent. Sales were the largest for any year since 1929.

The consolidated balance sheet, as of Dec. 31, 1937, showed current assets of \$108,635,091, including cash on hand and Government securities of \$11,612,064, as against current liabilities of \$9,137,196. Ratio of current assets to current liabilities was 11.9 to 1 and the company had no bank debt. Inventory of raw materials and finished products, valued at the lower figure of cost or market, amounted to \$73,987,017.

Yellow Coach Reports '37 Sales

Yellow Truck & Coach Mfg. Co. has reported net sales for the year ended Dec. 31, 1937, totaling \$73,451,555. Preliminary consolidated net profits for the year amounted to \$3,571,669, after deducting provision for depreciation of \$1,017,100 for

plants and equipment and provision for Federal taxes on income of \$423,170.

For the year ended Dec. 31, 1936, net sales totaled \$59,426,329, and net profit \$5,089,024.

Start Production on New Tractor

Allis-Chalmers Mfg. Co., Milwaukee, on Feb. 15 went into regular production of its new Model B tractor, designed and built to sell for about \$495. It is a general purpose machine, with air-cushion tires, suitable for highway as well as field. Practically a new and completely integrated tractor plant has been built at the main works in West Allis, suburb of Milwaukee, to produce the new machine.

Automobile dealers in the rural areas of the United States are expected to be an important factor in merchandising the new tractor, hundreds of franchises already having been awarded by Allis-Chalmers. Farm equipment demand is said to be holding up the company's tractor division with the result that plants in La Crosse, Wis., and La Porte, Ind., are operating at normal rates for this season. The industrial tractor works at Springfield, Ill., specializing in the manufacture of track-type machines, are down to two or three days a week, having been hardest hit in the economic recession of recent month.

40 Years Ago

with the ancestors of
AUTOMOTIVE INDUSTRIES

Duryea Model for 1898

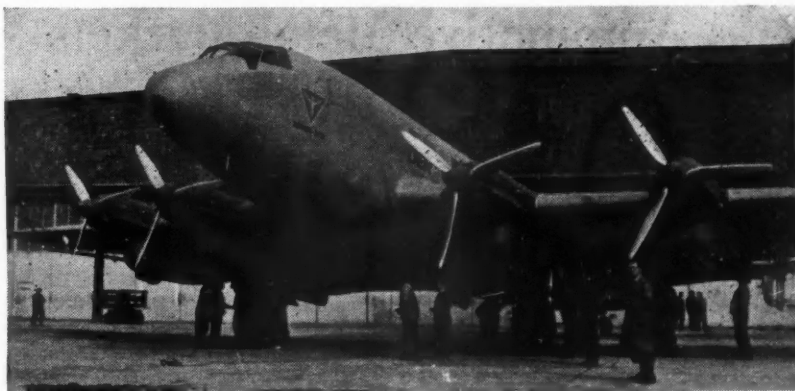
The new 1898 model of the Duryea Motor Wagon Co. is a most creditable piece of workmanship, both in exterior design and finish, and in its mechanical details.

The body is rather low and the wheel base large, giving great stability. The wheels, 30 and 34 in. respectively, are of wire, with heavy tangent spokes, and wide hubs.

The mechanism is extremely compact and fully protected from dust. The motor, of four horse-power, has two cylinders, 4½ by 14½, with counterbalanced cranks to prevent vibration. It weighs only 89 lb. exclusive of the fly-wheel, which, with its 70 lb., brings the total up to about 160 lb.

From *The Horseless Age*, April, 1898.

Automotive Industries



Globe photo

GERMANY'S LATEST

New Junker airplane with 4 engines capable of delivering over 4000 hp. and a cruising radius of approximately 3000 kilometers. (1865 miles). Forty passengers are carried in peacetime transport operations but wartime conversion can be quickly made to provide accommodations for 90 people. It is re-

ported that the conversion can be accomplished within a few minutes and that various German airports on the airplanes' transport service route have all the required military conversion equipment.

Weight of the airliner is 23 tons. Individual cabins are 35 ft. long and 6 ft. high. Cabins are sound proof and seats are readily converted into beds.

Calls Geiger "Anti-Labor Judge"

Jackson Makes Statement Before Senate Subcommittee; Claims That Milwaukee Jurist's Record Shows "Opposition to the Government"

Robert H. Jackson told the Senate Judiciary subcommittee meeting Tuesday that there has been a great deal of "misrepresentation" concerning the Government's effort to obtain a consent decree against large automobile finance companies at Milwaukee. Jackson at the time was undergoing a quizz on his qualifications to become Solicitor General. Later, the subcommittee voted five to two to confirm his nomination as Solicitor General.

"If you ask me if the Department of Justice uses coercion in obtaining consent decrees I would say yes," said Jackson. "If you ask me if it was used in this case I would say no."

"The Government, as in the Milwaukee case, sets down a very strict set of objectives which must be agreed to by the business involved before the consent decree is entered," Jackson pointed out.

Failure of consent decrees in the past, he said, could be traced to failure of the Government to insist upon certain stringent objectives.

Judge Ferdinand Geiger, who dismissed the grand jury in the automobile finance case at Milwaukee before it had returned an indictment, was referred to by Jackson as a "bitterly anti-labor judge." Jackson expressed opposition to bringing anti-trust action against automobile finance companies in Judge Geiger's court because of his record "of consistent opposition to the Government." It was stated by Jackson that Attorney General Cummings de-

scribed Judge Geiger as "an erratic sort of a man" who "might blow up the whole thing and give these people some sort of immunity."

Stating that there was no attempt to coerce the automobile finance companies into agreeing to a consent decree by the threat of criminal action Jackson said that indictments already were being sought against the Commercial Credit Co., the Commercial Investment Trust Co., and the Universal Credit Co. when consent decree conferences were begun.

The United States Government Printing Office has published a transcript of the hearing held Jan. 25, 1938, before the Committee on the Judiciary, House of Representatives, with regard to the official conduct of Judge Ferdinand A. Geiger.

Big Order to Four Wheel Drive

Four Wheel Drive Auto Co., Clintonville, Wis., has received an order valued at \$250,000 from the City of New York for 14 hook and ladder fire trucks, duplicating an order placed early in 1937. The firm also has received substantial orders from the oil industry and from long distance trucking firms. Current business ranges better than 10 per cent above the same period of 1937.

Libbey-Owens-Ford Dividend

Libbey-Owens-Ford Glass Co. declared dividend of 25 cents a share payable March 15 to holders of record Feb. 28. In 1937 the company paid \$4 a share.

February 19, 1938

Automotive Metal Markets

Last Week's Reduction in Price of Cold-Rolled Sheets Viewed As Move to Rouse Sluggish Automobile Market

Contrary to the expectations of many steel buyers, last week's reduction in the price of cold-rolled sheets has so far not been followed by developments that would shed light on the attitude of producers toward the price set-up in general. One explanation for the marking down of cold-rolled sheets is that it was nothing more than a technical adjustment to bring about alignment with the price of hot-rolled sheets. An entirely unconfirmed rumor also has it that a round tonnage order, for which keen competition had developed in the Detroit market, was responsible for the sudden price move.

Sheets for the automobile industry have always been considered in a class by themselves, first largely so because of the finishing process, which not all sheet-rolling mills are prepared to carry out to the satisfaction of buyers, but more recently because the success of the numerous continuous mills, that have been installed in the last few years and that are still being added to, depends almost entirely upon the tonnage consumption of automobile manufacturers.

The reduction in the price of cold-rolled sheets was, therefore, interpreted by many as a gesture by the steel producers that they want to do their share toward getting things moving in the automobile market. If precedent is followed, there should be an announcement of second quarter prices in the next few days, and this should clear up the fog that still envelops the price outlook. It is hardly surprising that, with more rumor mongering in the steel market than in months, there should be a story making the rounds that second quarter price schedules will cancel the price reduction in cold-rolled sheets that was announced only last week.

Meanwhile neither the character nor volume of automotive demand have changed very much, buying and specifications preceding conversion into parts by just long enough to insure delivery in keeping with assembly schedules. Primary operations in the steel industry are at 31 per cent of rated ingot capacity, the American Iron & Steel Institute, by the way, having announced this week that annual ingot capacity had risen 1,900,000 gross tons to 71,065,540 tons.

In the tin market, there is renewed

talk that the International Tin Committee at its meeting at The Hague, Holland, on Friday will further curtail export quotas, some of the tin producers advocating a reduction to 60 per cent of normal, compared with 110 per cent during the final quarter of 1937 and 70 per cent at present. The week's opening price for spot Straits was 40½ cents. On Tuesday the price rose to 41¼ cents. While consumers here are buying no more tin than is called for by their current and nearby needs, London buyers are reported to be willing to

extend support to the market, so that any bargain metal would be quickly snapped up, thus making further price dips rather unlikely.

Dullness continues to prevail in the copper market. A further increase in accumulations of refined metal was recorded on Tuesday by the Copper Institute, which authority reported an increase of 39,782 tons, making total domestic stocks at the beginning of the month 299,933 tons, the heaviest in some time. The price for electrolytic continues nominally unchanged at 10 cents.

The white metals show little change. Consumers are rather slow in covering their nearby needs of lead. Zinc buyers appear to have fairly heavy stocks.—W. C. H.

URW Urges "Share-the-Work" Plans

Goodyear Local Votes to Petition Company for Arbitration Board to Settle Problems of Layoffs, Operating Economies, and Hours

Going on record as being "unalterably opposed" to any lengthening of the six-hour shift, members of the Goodyear local of the United Rubber Workers Union of the CIO, at a special mass meeting Feb. 13, voted to petition the Goodyear Tire & Rubber Co. for establishment of an arbitration board to settle problems affecting operating economies, layoffs and changes in shift hours. The union voted to give the Goodyear management a week to comply with its requests before carrying its grievances up to the National Labor Relations Board.

Simultaneously, members of the B. F. Goodrich local of the United Rubber Workers Union voted to petition the B. F. Goodrich management to adopt a share-the-work program to avert further lay-offs. And the Firestone local began laying the groundwork of new provisions to be incorporated in a contract to be submitted to the Firestone Tire & Rubber Co. management when the present contract expires the latter part of April. The plan to be proposed by the union would be to retain the present Goodrich force and giving each employe 24 hours of work per week, with one week off in four.

The Goodyear local objected to the lengthening of the six-hour shift to include a 15-minute lunch period, claiming it was the forerunner of the eight-hour shift. Members adopted resolutions incorporating these two declarations of policy:

1—"That we are unalterably opposed to any increase in the working day beyond a six-hour shift, even to the extent of the 15 or 30 minutes in excess of six hours now

worked in certain departments." Demand was made for restoration of a strict six-hour day.

2—"That the problem of effecting necessary operating economies should be negotiated as a factory-wide problem . . . and if success does not attend the joint efforts of management and union representatives to reach a mutually satisfactory conclusion, they shall be referred to a board of arbitration . . . whose findings shall be binding on both the company and union."

The concerted union action came in an effort to stem steady lay-offs by Akron's major tire manufacturers and the alleged replacement of production workers with supervisors of shorter service.

The Goodrich mass meeting followed closely upon the heels of Akron's first sitdown of 1938, when 53 tire builders who had received lay-off notices, staged a sitdown that quickly spread and affected more than 1400 workers. Goodrich officials quickly closed the tire department, and suspended all operations, but within 24 hours the men returned to work amicably.

Tire manufacturers claim original equipment tire orders are down, while replacement sales are running far below those of a year ago. They also cite heavy finished inventories and express little hope of any revival of tire operations until the consumer market opens up with a return of normal buying activity.

Firestone Group May Test CIO

The recently formed Firestone Employees Protective Association, said to be composed of Firestone Tire & Rubber Co. workers not in sympathy with the CIO, has adopted

its constitution, the preamble thereof stating, "Friendly, peaceful relations with our employer will overcome many of our economic difficulties." The stated purpose of the group is "to restore and promote friendly relations with our employer and to protect, enhance and improve our jobs in Akron."

Formation of the new group is seen as a test of the strength of the CIO, which now has a contract with the Firestone Co. This contract expires the latter part of April. It was the first contract with a major tire company and the CIO, and terminated the company's 60-day strike of last spring.

All members of the new group must take an oath "to take no part in any stoppage of work unless such stoppage has been previously authorized by the association in accordance with the constitution." Only by a two-thirds vote can a strike be called.

Indium Used in Bearing Alloys

In a paper presented at the annual meeting of the American Institute of Mining and Metallurgical Engineers held in New York this week, C. F. Smart, metallurgist, Pontiac Motor Division of the General Motors Corp., disclosed details of a process of alloying indium with engine bearing materials which are subject to corrosion in the crankcase.

Indium is a rare metal, white and soft. According to the patent covering the development, indium may be alloyed with bearing alloys of cadmium and lead, particularly, and small percentages in the surface of the bearings are found to be sufficient to effectively inhibit corrosion in the crankcase.

At Pontiac, indium will be used in the cadmium-silver bearings used in the main bearings and connecting rods. It is claimed that the new alloy extends bearing life from 200 to 300 per cent, as compared with the bearing material now in use.

5000 at Bantam "Open House"

The Bantam Car Co., Butler, Pa., held "open house" on Tuesday of this week. Public inspection of the Bantam plant was invited and more than 5000 persons from Butler and vicinity took advantage of the opportunity to see how a car factory and assembly line operates.

The capacity of the plant, it was stated to trade paper and press representatives who attended, is 30,000 cars per year. Production for 1938, according to Bantam officials, is expected to be about 18,000.



Reaming

... Hole machine has alloy heat treated spindle fitted with enclosed flywheel for prevention of chatter

A machine for reaming, chamfering, burring, tapping, and special milling operations has been announced by Hole Engineering Service, Detroit.

The design incorporates an alloy heat treated spindle mounted in precision ball bearings and fitted with an enclosed flywheel for the prevention of chatter. The taper in the spindle is No. 3 Morse, and provision is made for a draw-bar when required.

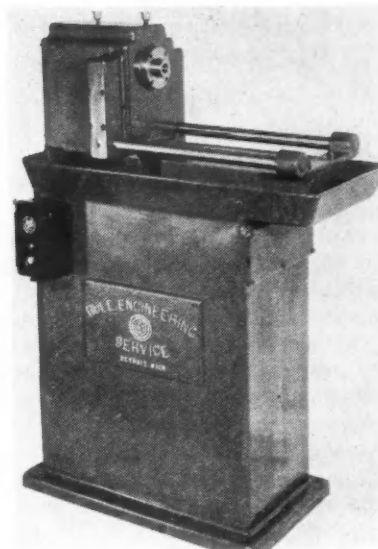
Speeds of 200 to 4000 r.p.m. are available through changing pulleys of the V-belt drive.

A feature of the construction is the round bar guides upon which fixtures can be mounted to present work in accurate alignment with the spindle. The brackets, on the headstock, carrying these guides are reversible side to side so as to locate the bars on the spindle center-line or below. A lever feed table can also be provided on these guides.

Precision Facing

... New Ex-Cell-O machine with spindle units arranged at right angles to the work table travel.

Ex-Cell-O Corp., Detroit, has introduced a new standard machine



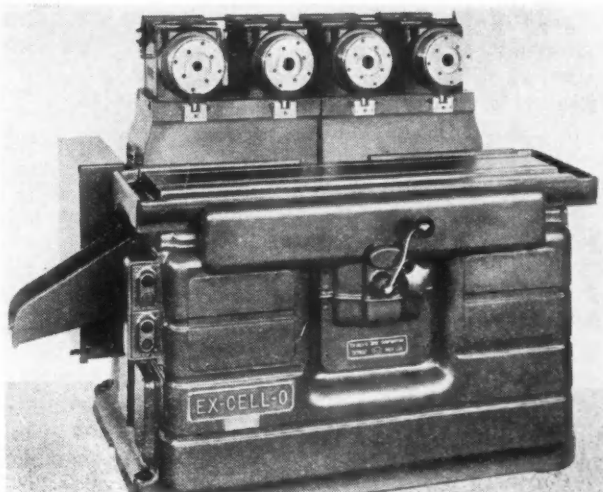
Hole machine for reaming, chamfering, burring, tapping, and special milling operations.

for precision facing, turning, and grooving, which is similar to its precision boring machines, except that the spindle units are placed at right angles to the work table travel. The equipment is suitable for the facing of pump bodies, clutch hubs, valves or miscellaneous flat surfaces; also, for such operations as turning rabbet diameters of motor end-shields and milling of compressor cylinder face slots.

Depending on the number and type of spindles used (any number from one to six can be accommodated on the bridges), driving motors can be mounted above, beside, or below the spindles. The work table travels.

(Turn to page 229, please)

New Ex-Cell-O equipment for precision facing, turning, and grooving.





AUTOMOTIVE ABSTRACTS

British Aero Engine Developments

Important developments in aircraft-engine practice occurred in Great Britain during 1937, one of these being the adoption of two-speed drives for superchargers, which permits of a better realization of the possibilities of the variable-pitch propeller. Such two-speed blower drives in combination with variable-pitch propellers are used on the Bristol Pegasus XVIII and the Armstrong-Siddeley Tiger VIII.

Among the new British aircraft engines of the year is the Rolls-Royce Merlin Mark II, a fully-supercharged 12-cylinder V of 5.4-in. bore and 6-in. stroke. It is cooled by ethylene-glycol. The boost pressure is controlled automatically by a servo mechanism operated from the pressure side of the supercharger, in such a way as to limit the throttle position to that which gives the maximum power permitted at any given altitude. The net dry weight of the engine is 1325 lb. and the maximum rating, 1050 hp. at 3000 r.p.m. at 16,000 ft. altitude. This rating is on the basis of a boost pressure of 6.37 lb. per sq. in. The engine has a gear reduction with a ratio of 0.477.

De Havilland Aircraft Co. in the course of the year developed an inverted 12-cylinder V air-cooled "Gipsy" of 500-550 hp.

The "Cirrus" engines of the firm of Blackburn Aircraft, Ltd., are now made in two inverted four-cylinder, air-cooled types, the "Minor" rated 82-90 hp. and the "Major" rated 138-150 hp. Cylinders are machined up of steel forgings, cylinder heads and pistons are of Y alloy, the valve gear housings of magnesium alloy, and the connecting rods of Hyduminium. The crankcase of the "Minor" is of magnesium alloy while that of the "Major" is of aluminum alloy.

The latest model of the Napier "Rapier," Series VI, is rated 370 b. hp. at 4750 ft. altitude and 395 b. hp. at 6000 ft. altitude. It is a 16-cylinder four-in-line engine, the advantage of which is that it has a very small frontal area. The crankcase is of magnesium alloy and the engine is fitted with a reduction gear giving a ratio of 0.39. At the rear of the engine there is a supercharger which

is driven from an extension of the propeller shaft through a lay shaft and spur gearing, the drive incorporating a safety clutch to protect the blower from sudden changes in engine speed. This engine has a dry weight of 713 lb.

The Napier Halford "Dagger" is a 24-cylinder engine with six cylinders in line. The new Model E108 "Dagger" has a supercharger of the double-entry pattern.

Bristol Aeroplane Co., Ltd., has a new 14-cylinder radial sleeve-valve engine known as the Hercules, which is said to be the most powerful engine that has yet passed its type test in Great Britain. It is rated 1290 hp. for take-off, and 1375 hp. at 4000 ft. This model is now undergoing flight tests.

As already mentioned, the Bristol Pegasus engine is now fitted with a two-speed blower. Using the medium supercharge ratio, this engine develops 980 b.h.p. for taking off, and 940 b.h.p. at 6500 ft. altitude. At 9500 ft., with the same blower speed still in use, 840 hp. is developed. At this altitude the high supercharge ratio may be brought into use, and the power then increases with altitude until at 17,750 ft. 900 hp. is produced, or only 80 hp. less than at ground level. All outputs given are maintained for five minutes. Cruising outputs are lower, but vary correspondingly with altitude and blower gear. The dry weight of this engine is 1110 lb.

The Armstrong-Siddeley Tiger VIII with two-speed blower, already referred to, gives a take-off power of 918 hp. on the low blower gear at sea level, and 862 hp. at 6600 ft. On the high-gear blower it develops 782 hp. at 15,000 ft. — *The Engineer*, Jan. 14.

Universal Base for Single Cylinder Test Engines

A new universal base for single-cylinder test engines has been developed by the Deutsche Versuchsanstalt für Luftfahrt E.V. (German Experimental Institute for Aviation, Inc.). This base will take cylinders of a considerable range in size and has provisions for changing the compression ratio of any of the cylinder sizes that can be accommodated, and the valve timing and valve lift, the

latter while the engine is running. It appears that the institute has been using a somewhat similar base in the past, and the new one was designed to permit of higher speeds, to make the mechanism more accessible even in the case of very small cylinders, and to permit simple and quick installation of test cylinders.

The crankcase is welded up of sheet steel and divided horizontally through the crankshaft axis. Main bearing supports are welded into the lower half, and each bearing has its own cap, so that after the upper half has been removed, the crank train is completely exposed. A realignment of the crankcase after the crankshaft has been removed is, therefore, no longer necessary. The mechanism for adjusting the compression ratio is located in the upper section of the crankshaft. It was made as compact as possible, so it can be conveniently used with small cylinders. The cylinder carrier is connected to the crankcase through a coarse, flat-top screw thread and two rotatably mounted rings that are connected together by yokes. A "spreading mechanism" serves to force the rings apart axially so that clearance in the threads is taken up. In order to safeguard the threads, four substantial cap screws are provided at the corners of the cylinder carrier, which provide a direct connection to the crankcase. The range of adjustment of the cylinder carrier is about 17/16 in. which is more than adequate for all purposes.

Provision is made on the universal base for all of the necessary accessories, including two magnetos, and there are two free power take-offs, to operate at crankshaft speed and half crankshaft speed, respectively, for driving such auxiliary equipment as an injection pump, for instance. Cylinders of from 60 to 180 cu. in. displacement, both air-cooled and liquid-cooled, can be accommodated on this test base.

A new adjustable timing mechanism was developed for two experimental cylinders of 5.2 and 5.4 in. bore and 5.2 and 5.6 in. stroke, respectively, these cylinders having four parallel valves in the head. It permits of changes in timing and in the valve lift while the engine is running, and it makes it possible to run the engines at speeds up to 3200 r.p.m. with a valve lift of slightly more than 0.5 in. The cams are split helically, and by means of a shifter fork and a spindle, one half of the cam can be shifted axially with respect to the other, which moves the lifting and dropping inclines apart angularly and permits of increasing

the valve-opening period from 270 to 330 deg. For a simultaneous advance or retard of the opening and closing times, the driving gears of the camshaft are mounted slidably on splines and provided with helical teeth. This permits of turning each camshaft through an angle corresponding to 62 deg. of crank angle while the engine is running. By making use of the two timing-adjusting means together, the timing can be changed within wide limits.

The valve-lifting motion is transmitted from the cam to a flat-faced (mushroom-type) cam follower or tappet, to a rocker lever, to a valve tappet, and to the valve. The valve tappet is provided with a clearance-adjustment screw. All moving parts were kept as light as possible. There are powerful retracting springs on the rocker levers, as it was found impossible to get sufficiently strong springs on the valves. The valve lift is varied by means of an eccentric carrying the rocker lever, in such a way that the valve clearance is not affected when the lift is varied between the limits of 0.315 and 0.630 in. All adjusting spindles are provided with counters which can be read from the control side of the engine, and the readings with the aid of tables give the values of the adjustments made.—ATZ, Dec. 25.

Plant Notes

(Continued from page 220)

with approximately 135,000 sq. ft. of space. The addition gives 30,000 sq. ft. of display and sales room space which has been air conditioned. The company is already occupying a part of the new plant and complete occupancy will be taken by March 1, according to C. L. Schneider, Chicago branch manager for the Fruehauf interests.

H. L. Kirsh, formerly general manager of the defunct Western Malleables, Inc., Beaver Dam, Wis., has organized Simplex, Inc., to take over the plant of the former F. Rassmann Mfg. Co. in that city to manufacture both gray iron and malleable castings, catering mainly to automotive, tractor and farm implement manufacturers. J. D. Hopkins and H. H. Petraska are associated with him in the new enterprise.

Wisconsin State Highway Commission, Madison, Wis., is taking bids until Feb. 18 for the construction and equipment of a new highway laboratory, service building and road sign fabricating shop on the campus of the University of Wisconsin. The Legislature has appropriated

Calendar of Coming Events

Foreign Shows

German Motor Show, Berlin,
Feb. 18-March 6, 1938
Leipzig, Trade Fair,
March 6 to 14, 1938

Conventions and Meetings

American Society for Testing
Materials, Spring Regional
Meeting, Rochester, N. Y.
March 7, 1938
Machine and Tool Progress
Show, Detroit....March 9, 1938
SAE National Aeronautic Meet-
ing, Washington, D. C.
March 10-11, 1938
SAE National Passenger Car
Meeting, Detroit,
March 28-30, 1938
SAE National Tractor Meeting,
Milwaukee, Wis..April 14-15, 1938
Chamber of Commerce Meeting,
WashingtonMay 2 to 5, 1938
American Foundrymen's Asso-
ciation, Foundry Show,
ClevelandMay 14-19, 1938

\$175,000 for the project. E. L. Roet-
tiger is chief highway engineer.

Early in January, Fairbanks, Morse & Co. moved its general offices to the modernized Fairbanks-Morse building at 600 S. Michigan Avenue, Chicago. This is but four blocks from the building at 900 S. Wabash Avenue, which was the company's headquarters for a third of its 108 years.

The company's new quarters have been completely remodeled and re-decorated with the first five floors of the building occupied by the executive, sales and departmental offices.

Tools of Tomorrow

(Continued from page 227)

verse is operated and controlled by a hydraulic cylinder. Adjustable dogs, located on the front of the table and covered by a guard, control automatically the rapid traverse, location and length of table feed.

Parts can be rotated by the spindles or held stationary on the table. An adaptor, arbor, or hand or air-operated chuck can be used to clamp the part to the spindle nose. For mounting the work on the table, a manually or hydraulically operated fixture can be used.

The new machine has a table 15½ in. by 50 in., upon which is a fixture

pad 15½ in. by 44 in. Center distance between the table ways is 9¼ in. Maximum table travel is 12 in.; rapid traverse is 12 ft. per min.; and feed may be adjusted from 1 to 23 in. per min.

Rubber Consumption

Estimated At 29,429 Long Tons
For January, 1938

Consumption of crude rubber by manufacturers in the United States during January, 1938, is estimated to be 29,429 long tons. This is an increase of 1 per cent over the December figure of 29,160 long tons, but 42 per cent under January a year ago according to statistics released by The Rubber Manufacturers Association. Consumption for January, 1937, was 50,818 long tons.

The RMA reports gross imports of crude rubber for January to be 42,135 long tons, a decrease of 38.3 per cent under the December figure of 68,305 long tons, but 28.4 per cent over the 32,820 long tons imported in January, 1937.

Total domestic stocks of crude rubber on hand Jan. 31 are estimated at 269,078 long tons, an increase as compared with Dec. 31 stocks of 256,618 long tons and 204,201 long tons on hand Jan. 31, 1937.

Crude rubber afloat to United States ports as of Jan. 31 is estimated at 57,356 long tons. On Dec. 31 last year 63,099 long tons were afloat and 55,096 on Jan. 31 a year ago.

January reclaimed rubber consumption is estimated at 6673 long tons, production 8467 long tons, stocks on hand Jan. 31, at 27,179 long tons.

Hits Highway Panacea

(Continued from page 221)

day that he favored the general idea of building super-highways and was studying the problem in an attempt to arrive at some practical plan. He indicated that a plan calling for toll roads and providing for the principle of "excess condemnation" might prove to be practicable.

NLRB Acts In Federal Bearings Case

The National Labor Relations Board has filed with the U. S. Circuit Court of Appeals in New York a petition seeking enforcement of its cease and desist order issued in December against the Federal Bearings Co., Inc., and an affiliate, the Schatz Mfg. Co., Poughkeepsie, N. Y.



In order to give readers of AUTOMOTIVE INDUSTRIES a clue to certain merchandising and service aspects of the automotive industry which are normally outside the scope of an industrial publication, we present herewith excerpts from the February issues of the four other magazines published by the Automotive Division of the Chilton Co.: *Automobile Trade Journal*, *Commercial Car Journal*, *Motor Age*, and *Motor World Wholesale*.

From AUTOMOBILE TRADE JOURNAL

"There is much evidence of the tendency of agriculture to mechanize as rapidly as income permits, but with almost 7 million U. S. farms using 1½ million tractors, it would appear that some 5½ million farms remain without mechanical power. In support of this conclusion: the American farmer between 1925 and 1930 spent an average of \$390 million for equipment, while in the years 1931-1937, this average dwindled about \$270 million. Thus there is still an indicated replacement backlog of over \$720 million."

From MOTOR WORLD WHOLESALE

"In a study of buying habits of people in smaller communities entitled 'Traffic Flow and Shopping Habits,' by the McCall Corp., it is shown that one of five, or 20 per cent of the automobiles are bought outside the home community—or in other words, that 80 per cent of the cars in these towns are 'home bought.'"

"Strength of the local dealer, repair shop and service station is shown to be even greater when it comes to aftermarket sales. The survey shows that only 11 per cent of the tires are purchased away from home and a mere 1.4 per cent of the gasoline is bought from other than local merchants."

From
COMMERCIAL CAR JOURNAL
(From "Ears to the Ground" Department) "If a 50 per cent
(Continued on page 246)

Automotive 12 Materials

By HARRY WILKIN PERRY

INSULATION is used in motor vehicles for three purposes: (a) to prevent short-circuiting or grounding of electrical currents, (b) to suppress or reduce noise inside the car body, and (c) to reduce the flow of heat through the walls of the body. The present article is confined to sound and heat insulation and the materials made and used for these purposes.

Physical and mental comfort of riders depends to a large extent upon maintenance of a temperature between 60 and 80 deg. Fahr. and prevention or absorption of car noise within the body. Noise is objectionable only in passenger vehicles, but heat control is essential in refrigerator truck and trailer bodies, and is highly desirable in motorcoaches, house trailers and private automobiles. A great deal of research study has been given in recent years to the problem of preventing passenger-car noise, but relatively little to temperature regulation, beyond the heating of the body in cold weather and open-window ventilation in warm weather. However, only when windows are open and the vehicle is in motion, does air circulation suffice to carry away excessive heat within the body under a blazing sun in midsummer.

General adoption of low, all-steel bodies finished in black or in dark colors makes effective heat insulation very desirable, as steel absorbs, conducts and radiates heat waves faster than any non-metallic material, and dark colors absorb heat instead of reflecting it, as white and light colors do. Motorcoaches, refrigerator bodies and house trailers in particular need insulation to exclude exces-

sive heat or to retain internal heat, depending upon the amount of radiation from the sun and the atmospheric temperature and air velocity.

Various materials used for insulating purposes depend for effectiveness upon several scientific principles. Most of the materials serve as both sound and heat insulation, but are more effective as one or the other, hence are employed differently according to their properties. They are manufactured for their respective purposes in numerous forms and may be roughly classified as follows:

Sound Insulations

Solid, elastic—Rubber.
Flexible—Felted fibers impregnated with plastic material.
Rigid—Fibrous board.

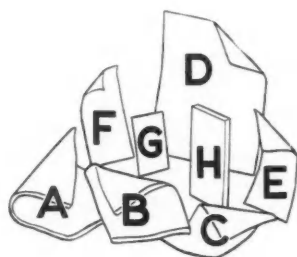
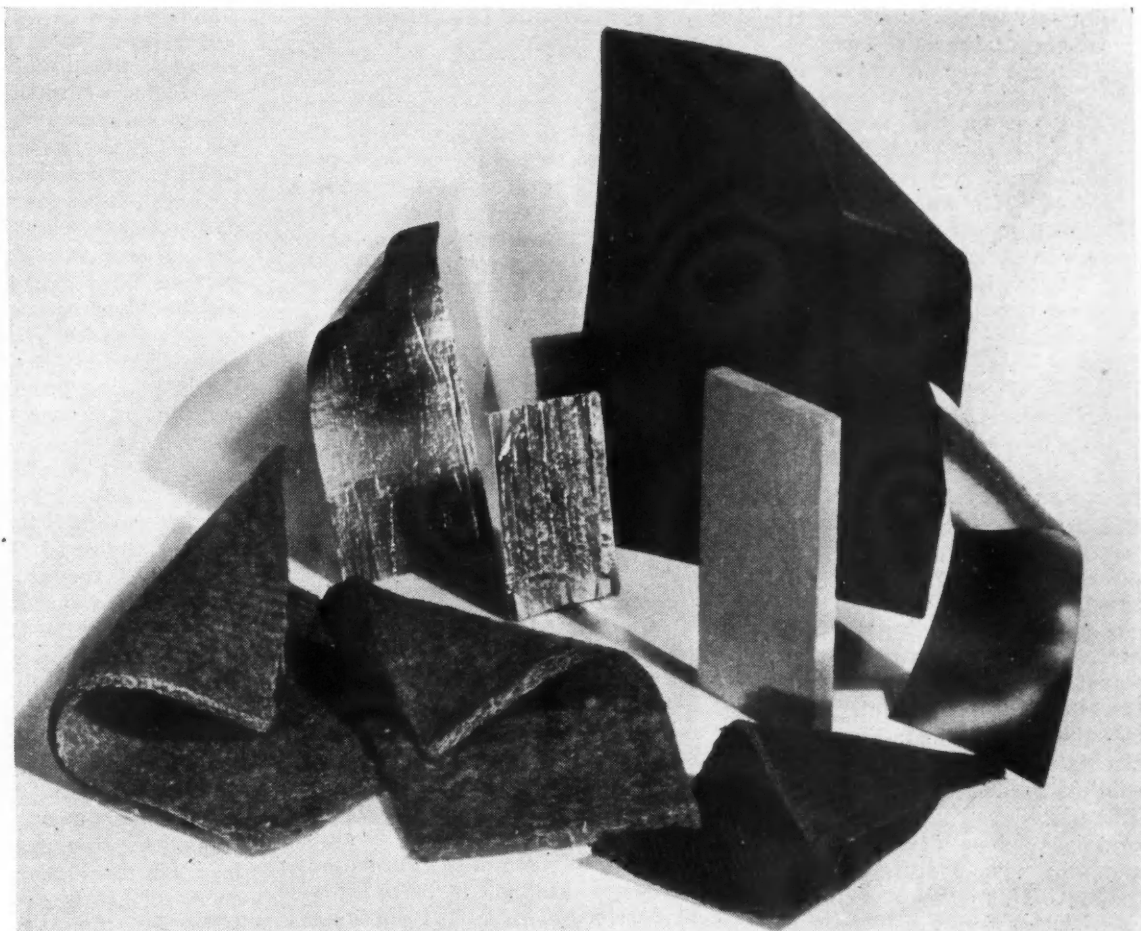
Modern

Sound and Heat Insulations

Rigid—Fibrous board.
Flexible—Fibrous felt, of jute, hair, cotton or wood fibers, or a combination of them.
Rock or mineral wool.
Glass wool.

Heat Insulations

Metallic, flexible—Aluminum foil cemented on paper.
The development and production of an effective and otherwise satis-



A—Jute felt punched to burlap back. Used on dashes for sound and heat insulation (Troy Blanket Mills). **B**—Rubber-impregnated jute felt, used under floor rugs (Troy Blanket Mills). **C**—Jute felt printed like Kersey felt, used for lining car trunks and luggage compartments (Troy Blanket Mills). **D**—Insulation made of felted paper and rag fibers saturated with asphalt and coated with mastic (Silex-Gagnier Fibre Products Co.). **E**—Aluminum foil cemented to heavy, tough kraft paper on one or both sides (Metallation-Reynolds Corp.). **F**—Heat insulation made by cementing aluminum foil to kraft paper reinforced with sisal fibers (Metallation-Reynolds Corp.). **G**—Combination of aluminum foil backed with waterproofed pleated air-cell paper (Reflect-O-Cell—Hermatex paper—(Aluminum Aircell Insulation Co.)). **H**—Insulating building board made of wood, paper and cotton fibers chemically treated and pressed into rigid board (Homasote Co.)

Insulating Materials for Modern Cars

factory sound or heat insulation material is not a simple undertaking. Too many physical and economic requirements have to be met. A knowledge of the fundamental principles of sound propagation and its suppression, or of heat absorption and transference and their prevention, is essential to an understanding of the problems to be solved. Besides accomplishing the desired insulation purpose, the material must have, perhaps, eight or ten other properties to suit it to motor vehicle use.

And, in the unceasing competitive effort to improve the vehicles and still keep prices to the minimum, the materials must be produced at a cost that will enable them to be sold within a range of 50c. to \$1, commonly allowed for 75 to 100 sq. ft. of insulation for the interior of a passenger car body.

An ideal sound-insulation material would to the maximum extent:

Prevent vibration of rigid structural parts or reduce the rate of vibration below audibility.

Prevent creation of air pulsations by vibrations,

Break up sound waves that strike the material,

Absorb instead of reflect the slightly compressed air of the wave crests,

Be light in weight, strong enough to withstand handling, easy to cut and apply, fire and water-resistant, non-absorbent of odors, sterile, indestructible by decay or action of moisture, strong enough in texture to resist break-

ing down and packing by repeated jolting, and low in cost.

An ideal heat insulating material would, to the greatest extent:

- Reflect radiant heat waves,
- Resist heat conduction,
- Prevent circulation of air in contact with warm surfaces,
- Seal minute openings in the insulated structure,
- Resist infiltration of air and water vapor,

Be light, strong, easy to cut and apply, resistant to water absorption and decay and to chemical deterioration or mechanical disintegration, and cheap.

Air performs highly important functions in both sound propagation and heat transmission. Thus, air set in motion by a vibrating source produces audible sound (if within a range of 20 to upward of 20,000 frequencies per sec.), and circulating air carries heat away from hot or warm surfaces by convection and distributes it to cooler air molecules. On the other hand, dead or non-circulating air is a good heat insulator, because it does not conduct heat readily. Except by radiation, heat does not pass through a vacuum and only slowly through a partial vacuum. This is the principle chiefly relied upon for the efficacy of the vacuum bottle and, in a recent patent, for the effectiveness of a double automobile windshield having a vacuum space between outer and inner panes of glass designed to prevent steaming up of the inner side and frosting or sleeting of the outer glass, since a cold surface condenses moisture in warm air and a relatively warm surface causes frost crystals to form in air at or slightly below the freezing point. All sound- and heat-insulation materials therefore depend upon inhibiting the part played by air in carrying sound or heat.

Sound Insulation

Audible vibrations set up in the car body originate in the powerplant, transmission mechanism, differential gears, tires, frame or body parts. The floor, top, side and door panels, window glasses and other parts will vibrate in unison with chassis vibrations of a frequency to which they can respond, particularly if in direct contact with the frame. Hence the adoption by car manufacturers in recent years of rubber engine and body mountings and spring shackles, which by elastic flexion absorb part of the energy and motion of the source of vibration and prevent its communication to the frame and thence to the body. These mountings are not, however, usually classified with insulation. The body mountings are soft rubber bushings interposed between the body sills and the chassis side rails on the hold-down bolts and between the bolt heads and the top of the sills.

Rubber strips in one form or another are used in some cases between body sides and fenders to prevent rattle and also for setting the glass in windshields, primarily to exclude rain and to cushion the glass against breakage. Rubber is employed, too, in floor mats, adhered to or impregnated in felted hair, jute or other fibrous material employed to absorb vibrations, to prevent conduction of heat, to seal small openings against drafts and to afford a cushion for the riders' feet. Mats such as the diamond-top rug cushions made by Allen Industries, Inc., have the rubber top indented or ribbed to keep the fabric floor rug from shifting and to increase the cushioning property of the mat. The mat is usually held in place by screws, rivets or other mechanical fastenings.

Any large sheet of thin metal, particularly if flat or nearly so, like the

under-floor pan or the dash of an automobile, acts like a sounding board to take up and amplify engine or frame vibrations. Hence any thick, soft covering in direct contact with it tends to decrease the rate or the amplitude of vibration or both and to prevent the propagation of air waves because of the springiness of the material and the interference of the material with the movement of air away from the vibrating surface. Felted fibrous materials, therefore, are used extensively for insulating various parts of automobiles and motorcoaches against noise.

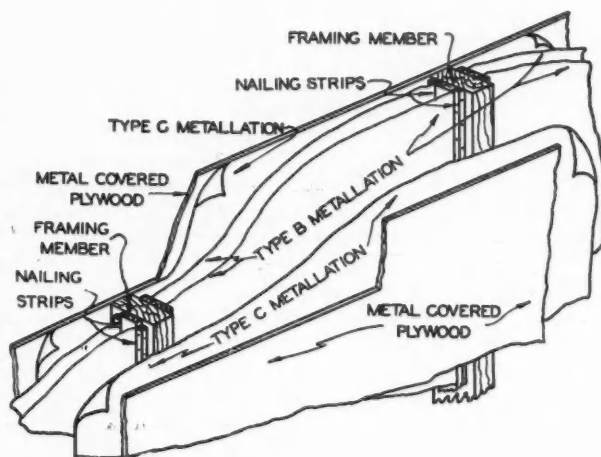
Insulating practices differ rather widely among the various vehicle manufacturers, but a good example is that followed in Chrysler-built cars, which contain about 30 sq. ft. of insulation material applied with rubber cement to the under side of the metal roof, upper rear quarters, sides and top of the cowl. A fairly thick layer of asphaltic material is laid on the upper side of the entire under-body and the heat in the paint-drying ovens softens the asphalt and causes it to adhere firmly to the metal. Approximately 30 sq. ft. are used per car. Doors, rear deck and trunk lid are treated with about 15 lb. of spray-on asphaltic deadener. To deaden toe and floor boards and provide some thermal insulation, about 10 sq. ft. of indented waterproof felt is riveted to the boards. The dash is lined with composite fibrous sheets. To insulate the body from chassis vibrations, 14 assembled mountings of rubber and steel parts attach the body to the frame.

Felt Insulations

Four kinds of felt insulation are manufactured and supplied to the automotive trade by the Western Felt Works. The first is a wool felt composed of sheeps' wool and cotton fibers formed into a homogeneous mass by application of heat and pressure, which shrivels and shrinks the wool fibers, causing an intermingling or knitting together of all the fibers. Second is hair felt, made of clean cattle hair formed into a composite blanket by punching or needling the hair into a burlap base. Third is jute felt, made of fibers from the inner bark of round-pod and long-pod jute trees grown in India, southern Asia and tropical Africa. The fibers are punched to burlap. Fourth is kapok felt, made by combining the down from the seed pods of the kapok or ceiba tree with a small percentage of wool and sometimes cotton fibers.

Method of applying aluminum-foil insulation to a refrigerator truck body.

Sheets of Type B, faced with foil on both sides of strong supporting paper, divide the air space into three spaces. Type C, faced on one side only, is placed next to the plywood paneling as the panels are nailed to the frame members with foil side against the plywood (Reynolds Corp.).



The wool felts and kapok felts are produced in 72-in. widths 45 to 55 yd. in length; the hair felts and jute felts principally in 36, 72 and 108-in. widths approximately 50 yd. long. Thickness of wool felts range in general from 1/16 to 1 in., of hair felt from 1/4 to 2 in., jute felt from 1/4 to 1 1/2 in., and kapok felt up to 1/2 in. The hair and jute felts weigh 4 oz. per sq. ft. 1/4 in. thick to 16 oz. for 1 1/2-in. thick, and 21 oz. for 2-in. felts. Burlap-based 100 per cent jute felt has a heat conductivity ranging from 1.08 B.t.u. per hr. for 1/4-in. to 0.27 B.t.u. for the 1-in. material, and sound absorption at 512 cycles per sec, from 0.19 to 0.48 per cent for the respective thicknesses. The conductivity of 1-in. hair felt is 0.26 B.t.u. per hr. and of kapok between burlap or paper a coefficient of 0.24 B.t.u.

These various materials are used for insulating the floor, roof, body panels and dash in passenger cars, trucks and buses, and flame-proofed kapok is employed considerably for insulating airplane fuselages. They usually are cemented to the surfaces with adhesives having physical properties commensurate with the particular applications.

Balsam wool processed into a blanket and faced with 26-gage 34 x 36-in. terne plate perforated with small holes occupying 10 per cent of its area forms the Burgess Acousti-Pad manufactured by the Burgess Battery Co. and used to some extent for sound insulation in engine hoods and truck cabs. Upward of 100 per cent of the energy of sound waves is said to enter the perforations and be dis-

Applying Plastic Sound Deadener to a Sheet of Metal with a Spray Gun (Spraytex-Monroe Auto Equipment Co.)



sipated in the wool. The thin sheet of terne plate, attached to pillars and bows with self-tapping screws and perforated mounting buttons, supports the insulating material. The company also makes engine intake silencers and silent mufflers provided with sound insulation based on the same principles.

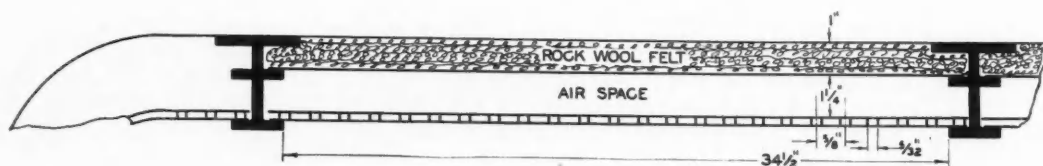
Felts are made by other companies commonly of jute, a light vegetable fiber, loosely matted or needled into a burlap base to produce soft, flexible blankets from 0.125 to 1.0 in. thick or more. The fibers

themselves, like all vegetable and animal fibers, contain a multitude of dead-air cells and are good non-conductors of heat. The felt also confines a large volume of air in the interstices between the fibers, and this acts as a cushion to absorb sound waves. The fibers are chemically treated to make them water-resistant, so that they will not mold or decay, and to repel vermin. Kersey felt, a general name, can be made of hair or jute on a needling machine and punched to burlap or made without reinforcement. It is used by nearly all motor vehicle manufacturers for sound or heat insulation or both. In one leading make of popular car it is employed at the instrument board, on the floor, in the roof, in the rear panels and in the seats. A great deal is made and supplied by Allen Industries, Inc. Therm-A-Pad felt, made by the Troy Blanket Mills, weighs 6.7 lb. per cu. ft. and, according to a certified test by the Armour Institute of Technology, has a heat conductivity of 0.25 B.t.u. per hr. per sq. ft. per inch thickness per deg. Fahr. temperature difference. The average conductivity of commercial insulations is about 0.30 B.t.u., according to the U. S. Department of Commerce.

Felt for some purposes, as for lining the trunk or luggage compartment, is made of hair or wool punched to burlap and printed to improve the appearance. Or it may be impregnated with latex and cement-



Showing the fibrous structure of mineral fibre blanket. Fibre diameter approximately 5.0 microns. This is a development by Johns-Manville Corporation.



Cross-section of roof construction of sound-insulated new type Greyhound coaches.

Rock-wool felt, 1 in. thick, or glass wool is supported at the top between longitudinal and transverse aluminum-alloy flanged ribs. Below this at 1 1/4 in. are panels of stiff fiber board perforated with 5/32-in. holes spaced 5/8 in. apart to provide ventilation and permit passage of sound waves for absorption by the insulation (Johns-Manville Co. rock-wool and Owens-Illinois Glass Co. glass wool).

ed to rubber for use as a floor mat. Weights of one make range from 20 to 40 oz. per sq. yd., according to type and thickness of the material.

Asphalt-Saturated Felts

Felts of vegetable fiber are employed extensively at the dash and toe board to segregate the noise and heat under the hood from the body interior. Silento Felt, made by the Johns-Manville Co., is composed of cellulose and wool fibers obtained chiefly from rag stocks saturated with approximately 50 per cent of asphalt and felted to a thickness of about .062 in. It is black, inert and waterproof and in one respect only, appearance, similar to roofing felt used in house construction. One type has plain surfaces and another type has one indented surface that forms air pockets. The material is cemented to the dash or other panels with an adhesive that resists a temperature of 300 deg. Fahr. and is applied in one or more layers. One of the largest car companies uses multiple layers of the plain and indented kinds cemented together and faced with KB board on the dash. The KB board is made of burlap, wood fibers and asphalt heavily compressed to about 0.110 in. thickness and is stiff and hard. A similar combination of four layers of felt is adhered to the car floor.

In the manufacture of Silex by the Gagnier Fibre Products Co., dry paper and rag fibers are felted on a paper machine to a thickness of 0.05 in. and the felt is then run through an asphalt bath to saturate it. Finally it is given a coating of mastic of a minimum of 10 lb. per 100 sq. ft., making the finished weight 0.40 lb. per sq. ft. and the thickness 0.06 to 0.065 in. In applying the material to metal, the company recommends painting the mastic side with a solvent, xylol preferred, applied with a soft brush sufficiently to wet the entire surface without dripping when vertical. After allowing an interval of about 4 min. for the solvent to dissolve the mastic, the insulation should be pressed against the metal

surface with an even pressure of 2 to 3 lb. over all parts. So applied, it should not slip, buckle or blister when subjected to a temperature of 220 deg. Fahr. for 1 hr. nor deteriorate at 0 deg. sustained for 24 hr. It is suitable for damping vibration and deadening noise in all of the car body below the belt line and on the entire inner surface of the metal roof. Some car builders use it also on the sides above the belt line.

A somewhat similar insulation is made of cellulose paper in multiple layers impregnated with asphalt and dimple embossed to hold the plies together. It is the product of Woodall Industries, Inc., and marketed under the trade name Dimpled Waddex. When used for sound and heat insulation it is applied with an adhesive to the metal of a turret top above the headlining or to the inside of door and side panels. When necessary, it is fireproofed. It is made in five numbers of plies, from 15 to 78 and ranges in thickness from 0.311 to 0.915 in. and weighs from 0.076 to 0.331 lb. per sq. ft. The heat conductivity range for the several thicknesses is 0.868 to 0.295 B.t.u./hr./sq. ft./inch thickness/deg. gradient. A sound absorption graph prepared by the company research physicist shows 85 per cent absorption at a frequency of 1000 cycles by the 78-ply and the same amount by the 26-ply at a frequency of 4000 cycles. The 26-ply is shown to absorb 60 per cent at frequencies from about 1500 to 3500 and the 78-ply at frequencies from 650 to 2000.

A panel-damping insulation made of a mastic of asphalt and reclaimed tire cord extruded on an impregnated roofing felt is produced by Woodall Industries, Inc., under the trade name Cordex. It is of a nature and consistency to be self-adhesive, so that, placed loose on the car floor, the temperature of 210 deg. or higher of the paint ovens causes it to soften

and adhere firmly to the metal. The roofing-felt covering provides a surface that withstands rough usage and prevents adherence of rubber mats or textile rugs to the material. Cordex is made in thicknesses of 0.125, 0.156 and 0.312 in., and weighs respectively, 0.64, 0.80 and 160 lb. per sq. ft. The damping values are given as 6.6, 5.3 and 2.2 sec., respectively, these values being the number of seconds required to reduce by 60 decibels the sound produced by a 20 x 20 x 1/4 in. bare rolled-steel plate suspended and struck in the center. The corresponding value of the bare plate is 120 sec.

Another material similar in appearance and application to the foregoing is Mastex, made of asphalt and a mineral instead of cotton fibers. It is thinner and lighter—0.09 in. and 0.55 lb. per sq. ft.—but has a lower damping value—7.7 sec. For comparison, the damping value of saturated felt 0.06 in. thick and weighing 0.373 lb. per sq. ft. is given as 14.7 sec.

Plastic Sound Deadeners

Another form of material for damping vibrations of sheet-metal parts of bodies is plastics, which are applied with a spray gun. One of these is Spraytex, manufactured by the Monroe Auto Equipment Co. as a homogeneous mass composed of granular air cells, asphaltic binder and plasticizers. It is sufficiently fluid to be applied with nozzle having a 3/8 to 1/2-in. orifice and a large stock hose from a tank under 70 to 100 lb. air pressure. It dries completely in 8 to 24 hr. at 70 deg., depending on thickness of coating, and when dry is immune to cracking and becoming brittle with age. Applications have been run successfully through paint-drying ovens at a temperature above 220 deg. Shrinkage does not exceed 3 per cent. The highly cellular filler

material makes Spraytex a good heat insulator as well as sound deadener.

Best results usually are obtained on interior body panels by applying a very rough coat from $\frac{1}{4}$ to $\frac{3}{8}$ in. thick. For exterior work on the underbody and underneath fenders to prevent road noise and stone and gravel rattle and denting, a smooth coat is desirable to prevent accumulations of dirt and ice. One gallon of material will cover about 6.5 sq. ft. $\frac{1}{4}$ in. thick and weighs approximately 5 lb., or 0.384 lb. per sq. ft. $\frac{1}{8}$ in. thick. The plastic conforms, of course, to all contours of the metal, forms a good bond with the surface and is not loosened by road shocks or atmospheric conditions.

To meet the demands of body and sound engineers for a deadener that would be most effective and at the same time easy to apply and moderate in cost, the J. W. Mortell Co. recently developed Insulmat Spray-on Deadener. On the principle that added weight is necessary to prevent vibration or reduce it below the rate of audibility, this fluid, chocolate-brown mixture has a high content of solid material and weighs 13.5 lb. per gal. It is applied with a spray gun to a thickness of $\frac{1}{8}$ to $\frac{1}{4}$ in., depending on area, thickness and location of the sheet metal in the body. Underbodies, door panels, cowls, rear-quarter panels and deck lids receive a thicker coat than roof panels as they are nearer the chassis frame through which vibration is transmitted. Some vehicle companies are experimenting

with applications on the inside of engine hoods and the under side of fenders. In one large body plant a crew of three operators spray the inside panels of 750 doors per hr. with an automatic electrically operated sprayer which plays a circular spray on the panels as they are placed on a rail which shields the edges of the panels.

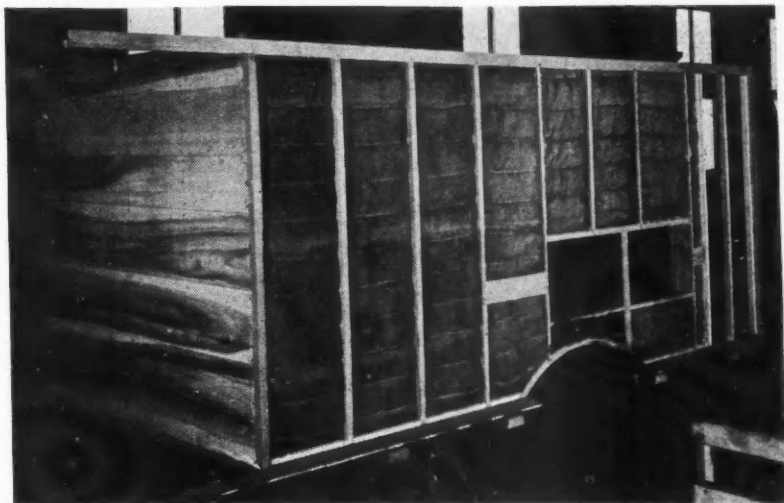
Insulmat is extremely resistant to abrasion and is non-inflammable and non-toxic. Other products furnished by the company include adhesives for applying jute felts and jute and

paper pads to steel panels. The adhesives are flowed, sprayed or troweled on the metal according to the part to be insulated.

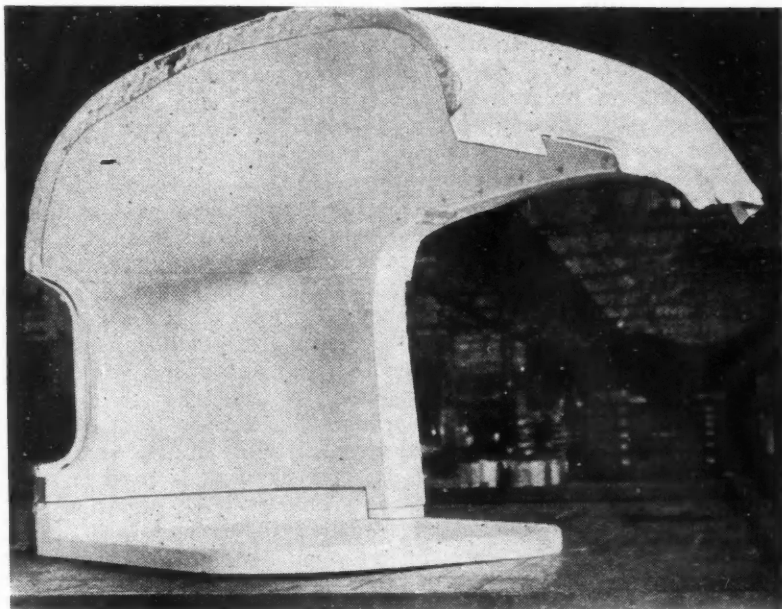
Mineral Wool and Glass Wool

Mineral or rock wool is manufactured for insulation by a number of companies. The Johns-Manville Co. has worked for five years on the development of a new felted rock wool product. Stone and slag and certain chemically suited modifiers are melted in a furnace, and a jet of steam blown against a stream of the flux as it flows from the base of the furnace breaks the molten material into exceedingly fine resilient filaments which fall fanwise on a moving belt. The fibrous material is then felted into a homogeneous formation of continuous length in blanket form to any desired thickness from $\frac{1}{4}$ in. to $2\frac{1}{2}$ in. and has a surface that is soft and smooth to the touch. It is manufactured in weights from $2\frac{1}{2}$ to 5 lb. per cu. ft. and has a heat conductivity of approximately 0.24 B.t.u./sq. ft./in. thickness/hr./deg. temperature difference. It is designated as Silento Felt type RW. A knife or shears cuts it easily and cleanly to any desired size of pad.

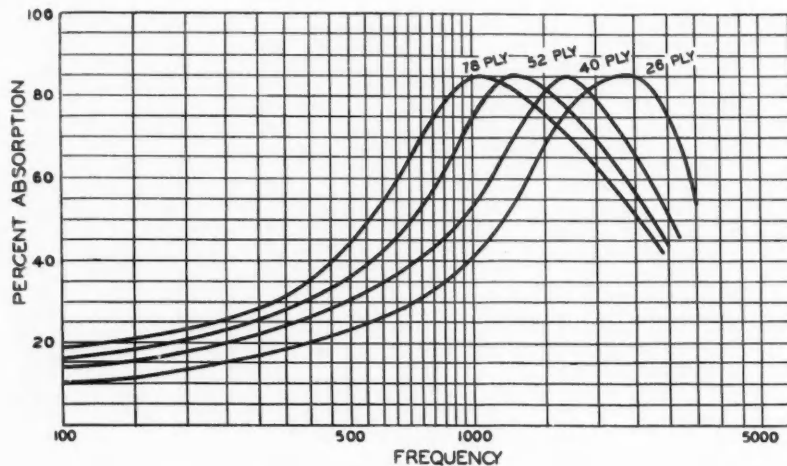
This rock wool is now being used in the new type Greyhound coaches under the roof, after exhaustive scientific study of the silencing problem. As a result of the study, special roof construction was developed. Flanged die cast aluminum-alloy ribs under the top covering are spaced $34\frac{1}{2}$ in. apart each way and support 1-in.-thick pads of rock wool. At a distance of approximately $1\frac{1}{4}$ in. be-



Refrigerator truck body in process of insulating with batts of grained and semi-felted Kapok (Dry-Zero Corp.).



Application of Balsam Wool and Terne Plate insulation to Interior of a Truck Cab (Burgess Acousti-Pad—Burgess Battery Co.)



Graph of sound absorption by asphalt-impregnated and embossed cellulose paper in multiple plies (Dimpled Waddex—Woodall Industries, Inc.).

low the wool, fiber-board panels are held in grooves in the ribs to serve as a ceiling finish. These panels are perforated with 5/32-in. holes spaced 5/8 in. apart both ways. Space between the panels and the insulation serves as a duct for ventilation of the coach body. Noise waves pass up through the perforations and strike the insulation, which partly absorbs them. Some wave motion is reflected and, passing down, meets waves ascending through the perforations, resulting in wave interference that further reduces the noise intensity. This system of insulation extends down the curved corners of the roof to the top of the windows and has proved exceptionally effective.

In half of the new coaches, glass wool is used as insulation material, with the same roof construction. The Owens-Illinois Glass Co., among several companies that make glass wool, produces it from silicate, soda ash and lime melted in a furnace and blown into filaments, much as rock wool is made. It is formed into blankets from 1 1/4 to 1 1/2 in. thick and put up in rolls like cotton batting. For use in vertical positions, it is reinforced by stitching the wool between sheets of muslin like a quilt or comfort, with the stitching 4 in. apart each way. To further support it against jolting, it is strung on horizontal wires when put in place. Shears are used for cutting the insulation. Eighteen pieces 39 in. square are employed in a motorcoach body. The glass wool weighs 1 1/2 to 3 lb. per cu. ft. according to type. Owing to the springy nature of the rock wool and glass wool fibers, they tend to expand instead of packing down under jarring and do not dis-

integrate. Like rock wool, glass wool is inorganic, inert, fireproof and non-absorbent of moisture and odor, and so does not mildew or decay. Both glass wool and rock wool are used for silencing the fuselage in leading makes of large transport airplanes.

Rigid Fibrous Insulation

Rigid insulation is used extensively in building construction, and in some motor-vehicle applications for sound suppression or for both sound and heat insulation, where it can be employed in its flat form. One brand is Acousti-Celotex, made of bagasse, which is sugar-cane from which the juice has been squeezed for the manufacture of sugar. The bagasse is shredded into long, strong, light and springy fibers, which are then treated with chemicals to make them waterproof and toxic to fungi, termites and other cellulose-destroying organisms. The macerated fibers are then matted together and rolled under pressure from a thickness of 4 in. to 1/2 in. and dried in a long oven as the strip comes continuously from the rolls, one side perforated with 441 holes per sq. ft., 3/16 in. in diameter and 3/8 in. in depth.

Celotex is also made in thicknesses up to 1 1/4 in. The 1/2-in. material weighs 0.84 lb. per sq. ft. The average noise reduction coefficient at frequencies from 256 to 2048 cycles is 0.50. It has a heat conductivity of 0.33 B.t.u./hr./sq. ft./in. thickness/deg. temperature difference. Other insulations produced by the same company are made of rock wool, expanded stone, sized felt, and wood fibers passed through a binding emulsion of hot cement and formed

between steel rollers and belts heated to a temperature of 500 deg. Fahr.

Heat Insulation Materials

Insulation against heat transmission involves factors other than those concerned in sound insulation. These are heat radiation, conduction and convection, and permeability by air and water vapor. It is not necessary that the much longer and slower vibrations of sound waves be suppressed, but most heat insulations also act to a considerable extent as sound insulation. Most of the insulations are of fibrous material—vegetable, animal or mineral, or a combination—chemically treated to make them fire- and water-resistant. The insulation practices followed by truck and bus manufacturers are indicated by the methods followed by two companies.

In cab-over-engine International trucks, 1/4-in. standard felt stock is cemented over the tunnel and water line in the cab, and in all models the floor is covered with a mat of 0.08-in. rubber backed with 1/4-in. 35-oz. jute felt and held in place by mechanical fasteners. In the standard models the dash, cowl units and sides of panel bodies are insulated with 3/8-in. waffle-embossed paper fiber on trim board (Seapak) attached mechanically. The roof of panel bodies is covered with 3/16 in. Upon vehicle board nailed to the bows. Single-ply embossed paper (Muffle-Pad) is cemented to cab doors and back panel, and two-ply Muffle-Pad between cab rear panels and pillars and on rear door panels, is a silencer. Celotex board is built in between the metal seat-box panels and cover on the cab-over-engine models, and all panel bodies and cabs are trimmed inside with pyroxylin-coated 0.07-in. paper board embossed in imitation of leather.

On Reo trucks, rock wool confined in sheet metal is used on the engine hood in cab-over-engine models, 17 sq. ft. being employed. A pad of Kersey felt, 6 sq. ft. large, is bolted to the dash for sound insulation. Indented Seaman paper (Seapak) is cemented to the truck roof with Dependon No. 52 made by the Chemical Products Co. In Reo buses, 36 sq. ft. of rock wool is used on the engine compartment partition in pads compressed from 1 1/4 in. to a thickness of 7/8 in. between sheet metal. Heater pipes are covered with 15 sq. ft. of 1/16-in. woven asbestos cloth. The top of the roof is painted with aluminum paint to reflect radiant heat, and there is 1 3/8

in. of dead-air space between outer and inner coverings of the bows.

A heat insulation made of molten slag, blown into light, fluffy wool, is produced by the Homasote Co. in batt, loose or granulated forms for use as filler for dead-air spaces. The batts come in 15 x 23 in. size, 4 in. thick.

For use in refrigerated and insulated truck bodies, two types of insulation are manufactured by the Dry-Zero Corp. Both are made of the fine tubular fibers (Kapak) from seed pods of the tropical ceiba tree and, by a process of "graining," the fibers are semi-felted into a batt in which the fibers lie across the line of heat flow. Bureau of Standards tests show that this process increases the insulating efficiency of the material from 100 to 200 per cent, and that the coefficient of heat conductivity is 0.24 B.t.u./hr./sq. ft./inch thickness/deg. temperature difference. University of Minnesota tests show that it is non-absorbent of moisture to a high degree and maintains its heat-stopping ability in the presence of moisture better than most commercial insulation materials.

Dry-Zero is made in blanket form by stitching the grained batt between rot-proof, fire-resistant burlap, in sizes as specified by the body builder, up to 120 in. wide and 3 in. thick. Usually it is applied in large sections compressed in the dead-air spaces between frame members and outer and inner walls. It is also made as Sealpad by enclosing the batt between paper covers bound at the edges with muslin and carrying sealing flanges to secure it to the frame members. The flanges are coated with asphalt-covered sisal-kraft protected temporarily by cloth strips, which are pulled off before applying the tacky adhesive to the posts. This pad material also comes in thicknesses from 1½ to 3 in. and in standard rolls 36 in. by 50 ft. without sealing flanges. The waterproof paper cover and sealing flanges are effective in sealing the shell of the truck body against microscopic passages through which air and water vapor can pass, resulting in a transfer of heat and condensation of moisture within the walls.

House-trailer insulating practice varies greatly, because of the differences in materials of construction and the purposes for which trailers are purchased. Many are custom-built and insulated or not as desired by the buyers. A great number, however, are used as year-round dwellings, a considerable percentage

of them in northern States and in western Mountain States. Plywood, Masonite, Shermanite and Homasote, used by many trailer companies for side and top panels and for interior finishing, are themselves fair insulating materials, and in all cases an insulating dead-air space is provided between outer and inner sheathing. Leatherette employed over cotton batting as an external finish, and also for inside finish, also serves as insulation in some makes.

Under various trade names a variety of rigid structural insulations are made in the form of wallboard. Wood or other coarse vegetable fibers are the basic materials used in their manufacture. The wood is softened, shredded, combined with paper or cotton fibers and treated chemically to preserve it against fungi. After the treatment it is rolled out into a single continuous board up to 6 or 8 ft. in width and 1000 ft. in length, before being cut into commercial lengths. Shermanite is plywood bonded to a thin sheet of steel to provide a smooth, hard surface for painting, and to prevent penetration by air and moisture. All of these building boards depend for their heat insulating property upon the low heat conductivity of the cellular structure of the fibers and, except Shermanite, on the relatively large volume of air trapped in the material.

A good example of such rigid insulation is Homasote, usually supplied in 15/32-in. thickness, but also 5/32 in. thick, and in sizes from 4 x 4 to 8 x 14 ft. It has greater bracing strength than natural wood sheathing and is nailed or screwed to the frame members of the structure. Although rigid, it can be bent to a radius of about 2 ft. and, by kerfing the back with a saw at right-angles to the line of curvature, can be bent to much smaller curves. The 15/32-in. board weighs 1.02 lb. per sq. ft. Air moving at a velocity of 40 m.p.h. filters through at a rate of only ½ cu. ft. per hr. per sq. ft. The material absorbs only 17 per cent of its weight in water in 20 hr. of immersion. Although not fireproof, it does not burn with a flame but smoulders slowly. For inside finish, Homasote is made in "panelyzed" form by casting in wood molds and shows the natural grain of the woods. The panels come in 16-, 32-, and 48-in. widths and 8- and 8½-ft. lengths, and are stained in silver gray, pine tone, Old English light, and Old English dark shades.

Where greater heat insulation is desired than that afforded by the structural materials and dead-air spaces, trailer builders employ various types of special insulation. Bender all-steel trailers are insulated in all walls and roof with Seapac, applied with a roller against a cement

Applying a blanket of paper-covered Kapok insulation to a frame.

A protective strip of muslin is being removed from the tacky adhesive-covered flange of the paper before cementing the blanket to the posts (Dry-Zero Corp.).



paste sprayed on the metal panels. About 360 sq. ft. of insulation, single layer, is required for a 16-ft. trailer. About four-fifths of the roof is covered with aluminum-painted leatherette, to reflect heat from the sun.

All dead-air spaces in the arched roof of standard Alma trailers are filled with pads of glass wool, which has been found very effective.

When insulation is wanted by the customer, the Palace Travel Coach Corp. recommends aluminum foil on cellular paper installed in the side walls and, if specified, in the roof, one layer being considered sufficient for ordinary conditions, but several layers are necessary for maximum temperature control. Approximately 500 sq. ft. are required to insulate an 18-ft. trailer with a single layer. The top of the roof is painted with aluminum.

The Covered Wagon Co. has adopted Reflect-O-Cell aluminum-foil insulation as standard insulation. It is applied in the air spaces under the plywood roof and in the Shermanite steel-bonded plywood sides. The waterproofed canvas cover on the roof has a heavy coat of aluminum paint, and the inside of the top plywood is also aluminum-painted. The floor consists of a $\frac{5}{8}$ -in. layer of creosoted plywood bolted to the chassis frame, a $\frac{1}{2}$ -in. layer of Celotex, a layer of hardwood flooring, and linoleum floor covering cemented to the boards.

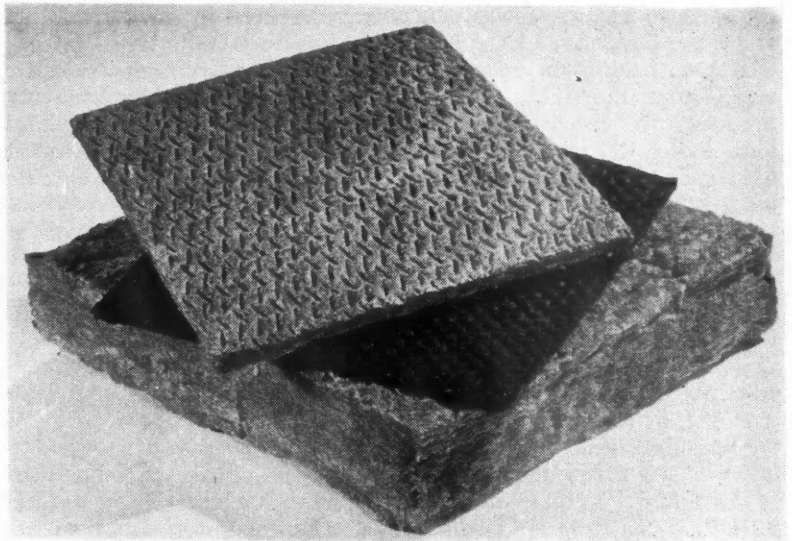
Aluminum-Foil Insulations

Aluminum-foil insulations depend for their efficiency upon an entirely different principle than that of the fibrous boards, felts and mineral wools. To employ a metal for heat insulation may seem absurd, considering that the heavy metals are among the best absorbers, conductors and radiators of heat known. However, certain bright-surfaced metals, as mercury, polished silver and aluminum, are the best-known reflectors of both the short visible light waves and the long, invisible heat waves. Therefore, very thin aluminum foil that looks almost precisely like tin foil is used as recently developed insulation.

In a letter circular issued in June, 1936, the U. S. Department of Commerce stated that up to that time insulation of the reflective type had not come into prominence commercially. Previous to that time the department had listed insulating materials under two headings and it now added a third classification. Going on to describe this type, the circular stated that "clean metallic surfaces in gen-

eral are good reflectors and poor emitters of radiant heat," that "aluminum foil is used to increase the insulating value of air spaces by reducing heat transfer by radiation," but that "it has no value when placed in continuous contact with solid material on both sides except insofar as it may act as a building paper in preventing air leakage," and that "the insulating effect does not depend on the thickness of the metallic foil." It states further that "the insulating value of air spaces bounded on one or both interior surfaces with aluminum foil increases with increasing width of space up to $\frac{3}{4}$ in.," that "thin layers of dust readily visible to the eye do not cause any very serious lowering in the reflecting power" and that "the reflectivity is not appreciably reduced (by corrosion) until the aluminum is covered by an easily visible layer of corrosion products."

Comparative data in a table in the circular gives the reflecting percentage of aluminum as 85 to 95, of aluminum paint as 65, and of ordinary paper as 10. The insulating value of a sheet of aluminum on a supporting medium, such as paper, dividing an air space, is given as 1.21 to 1.50 inches of insulating material against 0.90 for aluminum paint and 0.53 for ordinary paper. A wide space divided by two reflecting sheets of foil has a value of 1.90 to 2.30, compared with 1.43 for aluminum paint and 0.79 for paper alone.



Silento Felt, Type R. W., as manufactured by Johns-Manville. The top layer is a $\frac{3}{4}$ -in. thick felted product of mineral fibre furnished in roll or blanket form. The bottom layer is a sample of the same product but felted to a $2\frac{1}{2}$ -in. thickness. The black separating layer is a piece of rag felt asphalt saturated Silento.

In terms of British thermal units, 1.50 in the table represents approximately 0.20 B.t.u./hr./sq. ft./deg. Fahr./temperature difference.

The Reynolds Corp. produces Metallation, a type of aluminum-foil insulation made by cementing pure aluminum foil 0.01 in. thick to one side or both sides of 80-lb. tough kraft paper with asphalt cement. Another type has the foil cemented to a much heavier and stronger sisal-reinforced kraft paper to give greater resistance to puncture and tear. The first type is made in 25, 33 and 36-in. widths and rolls containing 250 sq. ft. weighing approximately $11\frac{1}{2}$ lb. per roll for the single foil and 15 lb. for the double foil. The Sisalkraft comes 33 in. wide, 250 sq. ft. to the roll, and weighs 18 and 22 lb., respectively, for single and double coated. These materials are used extensively in battleships and in the roofs of commercial buildings, including large garages. They are pliable but not well suited to application to small domed structures such as automobile turret tops, though they can be used readily wherever curvature is in one direction only.

A similar insulation made by the Aluminum Aircell Insulation Co., and named Reflect-O-Cell, has foil cemented to Hermatex insulating paper, which is impregnated with moisture-resistant material and formed by cementing together a plain sheet of the paper and a pleated

sheet to produce parallel closed air cells. The foil reflects 90 per cent or more of radiated heat and the paper is highly resistant to heat conduction and convection. The paper gives the foil self-supporting strength, yet the combination is soft and pliable and can be formed to all curved surfaces. Crumpling does not impair the reflecting value. The thermal transmission is 0.27 B.t.u./sq. ft./hr./deg./temperature

gradient. Reflect-O-Cell weighs only 38 lb. per 1000 sq. ft. and is furnished in standard widths of 17 and 24 in. in rolls of 400 and 500 sq. ft., respectively.

Aluminum is impenetrable to air and moisture, and therefore provides a superior air seal and prevents sweating. The insulations are readily cut with shears and are easily applied. To be effective, they must be used to divide air spaces, and the

major portion of the foil surface should be kept at least $\frac{3}{4}$ in. from the adjacent heated surface of the vehicle structure. One sheet of double-faced material, or two sheets of single-faced, spaced $\frac{3}{4}$ in. apart or more and back to back, are recommended, as the outer foil reflects radiated heat from the sun and the inner foil reflects, and so retains, heat in the interior of the vehicle body in cold weather.

Automotive *Materials* **NEW DEVELOPMENTS**

Patent New Method for Producing Beryllium

A new process for the production of beryllium has been patented in France by the German Dye Trust (I. G. Farbenindustrie A. G.). Crystalline beryllium is produced by the reduction of beryllium chloride by means of magnesium in an atmosphere of inert gases. The mixture of magnesium and of beryllium chloride is introduced into a molten bath of magnesium chloride heated to at least 1475 deg. Fahr., on the surface of which an inert atmosphere is maintained—inert with respect to the materials being handled—and which in this case consists of hydrogen.

After cooling the metallic constituents are separated by washing. One may obtain a mass of nearly pure beryllium by agglomerating under pressure the mass of metallic crystals, melting them in vacuum and continuing to heat them in an atmosphere of hydrogen up to 2500 deg. Fahr. The pressure of the inert gas on the surface of the bath during the introduction of the mixture should remain above one atmosphere. —*La Technique Moderne*, Dec. 15.

British Patent Process for Production of Formaldehyde

In England and France formaldehyde (one of the two materials from which Bakelite is produced) is now obtained by an application of the

process for the synthetic production of methanol, starting with carbon monoxide and hydrogen. According to a recent British patent (No. 450,449) one may subject to the action of catalysts, mixtures of these gases containing up to 30 per cent hydrogen. The catalyst consists of finely divided nickel in combination with other metals.

In order to obtain good results, it is necessary to very thoroughly purify the gases, which are then passed through two series of apparatus at a temperature of 575-675 deg. Fahr. The gases finally arrive at atmospheric pressure and at a temperature of 350-470 deg. Fahr. at the catalyzer, where the duration of contact is two minutes and the gas velocity 200 ft. per min. The catalyst must be frequently regenerated, by means of nitrogen, for instance. As a rule the gases do not form any solid compounds with the catalyst.

Removal of Carbonate From Plating Solutions

Removal of sodium carbonate from cyanide plating solutions is said to be facilitated by "du Pont Carbonate Remover," a material just announced by the new electro-plating chemicals division, E. I. du Pont de Nemours and Co. The new product is a calcium sulfate compound of slight solubility and serves as a precipitating agent which can be maintained in excess at all times, permitting continuous disposal of carbonate as it is formed.

Claims advanced for the material are: 1. Prevents useless and expensive dumping of valuable plating solutions; 2. Restores almost inoperable solutions to their normal efficiencies; 3. Enables solutions to be operated throughout the hot summer months; 4. Eliminates the expense and inconvenience of replacing costly plating solutions; 5. Does not introduce any undesirable impurities into the plating bath; 6. Increases efficiencies and production and reduces the maintenance costs; 7. Prevents pollution of streams, sewers and waters by sodium cyanide.

A complete description of the product is contained in an electro-plating service bulletin issued by the company. Data is given on the chemical analysis of carbonates and the results of laboratory and commercial tests conducted with solutions of cadmium, copper, zinc, and silver. A copy of this bulletin may be obtained from the editorial department, AUTOMOTIVE INDUSTRIES.

Preventing Adherence Of Welding Spatter

A metal coating for preventing adherence of welding spatter to parts adjacent to welds has been developed by the Wayne Chemical Products Co., Detroit. The producer of this coating points out that it eliminates the labor of chiseling, filing, scraping, and cleaning off spattered metal and that its use also lessens the possibility (Turn to page 246, please)

Buda Brings Out New Diesel Four and Six

THE latest model to be added to the Buda line of automotive Diesel engines is the 4-DT-196, a four-cylinder engine of 196 cu. in. displacement. This is one of the smallest multi-cylinder Diesel engines on the American market today, being rated at 42 hp. at the peaking speed and 21 hp. at 1000 r.p.m. The cylinders have a bore of $3\frac{5}{8}$ in. and the piston stroke is $4\frac{1}{2}$ in. The maximum torque of 110 lb.-ft. is developed at 1500 r.p.m. and corresponds to a power output of 33 hp. The specific fuel consumption is given as 0.5 lb. per b. hp.-hr.

Cylinder block and crankcase are in a single casting of chrome-nickel cast iron. A pressed-steel oil pan is used, and the joint between this and the engine block is in a plane 3 in. below the crankshaft axis. Cylinders are provided with dry liners of chrome-nickel-molybdenum iron which are finished by grinding. Cylinder heads also are cast of chrome-nickel iron, and are secured to the engine block by eleven alloy-steel $\frac{1}{2}$ -in. studs. The combustion head is of the Lanova air-chamber type, the combustion space being of flat lemniscate form, conforming to the two valves in the cylinder head. The injection nozzle enters this chamber centrally at the side, and directly opposite it there is an air chamber in which air is compressed during the compression stroke. Injection, of course, starts before the end of the compression stroke, and while most of the fuel injected remains in the space between the tip of the injection nozzle and the inlet to the air chamber, some actually enters the air chamber with the air still flowing into the latter. Ignition is initiated in the space between the nozzle and the air chamber, and combustion spreads from there into the air chamber. The fuel that enters the air chamber comprises the most finely atomized and the most volatile fractions, and because of its passage through the very narrow inlet to the air chamber it is also thoroughly mixed with the air. For that reason combustion seems to proceed more rapidly in the air chamber than in the combustion chamber proper, and the rapid pres-

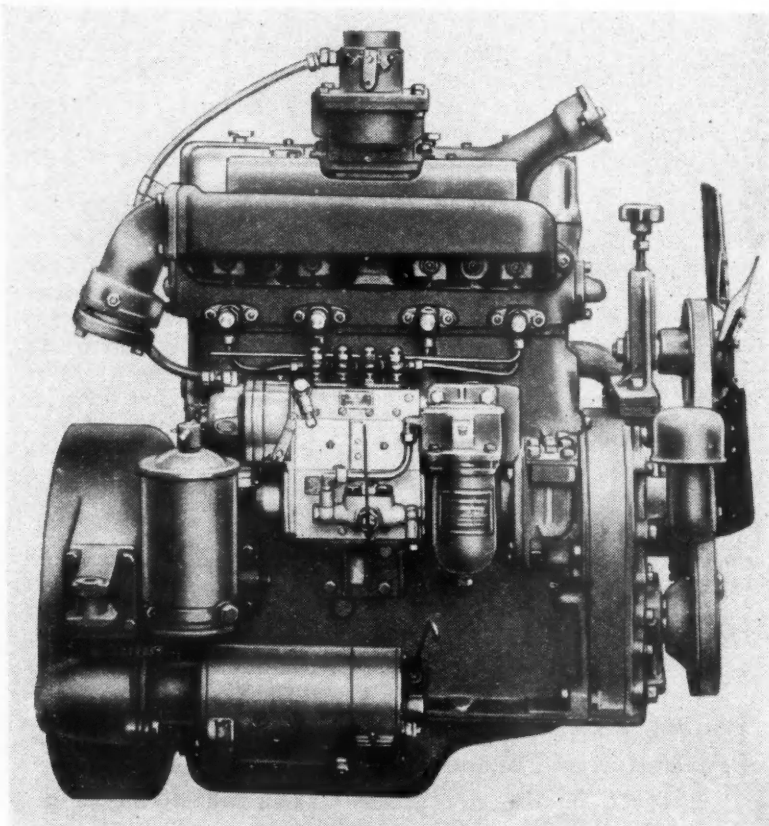
sure rise in the air chamber results in the ejection of the contents of the chamber into the main combustion chamber and the production of turbulent flow therein.

Pistons are of aluminum alloy, $6\frac{1}{32}$ in. long, and fitted with five rings each, the compression rings above the piston pin being $\frac{1}{8}$ -in., and the oil rings below the pin $\frac{3}{16}$ in. wide. The piston pin is of $1\frac{1}{4}$ in. diameter (or a little more than one-third of the bore). It is of the full-floating type and is tapered out from both ends so as to combine lightness with rigidity. Connecting rods are of the regular drop-forged type and are rifle-drilled for pressure lubrication of the piston-pin bearing. They are $9\frac{1}{2}$ in. long between centers. The crankshaft is supported in five 3-in. main bearings of the following lengths (front to rear): $1\frac{1}{2}$ in., $1\frac{1}{16}$ in., 2 in., $1\frac{1}{16}$ in., and

$2\frac{1}{8}$ in. Connecting-rod bearings are $2\frac{1}{8}$ in. in diameter by $1\frac{5}{8}$ in. long. All bearings are of the steel-back precision type and require no hand scraping. Connecting-rod caps are held on by two $7/16$ -in. chrome-nickel-steel bolts.

Valves are located in the cylinder head and are operated from the camshaft in the crankcase through side rods and rocker levers. Intake valves are made of S.A.E. No. 3140 (chrome-nickel) steel, exhaust valves of 21-12 austenitic steel. Inlet valves have a port diameter of $1\frac{3}{4}$ in., exhaust valves of $1\frac{3}{8}$ in. Timing gears are of steel, with a non-metallic idler. There are five helical gears in the timing-gear train and they have a face width of $1\frac{1}{4}$ in., and a diametral pitch of 10. The camshaft is supported in three phosphor-bronze bearings, the front bearing being of $2\frac{1}{8}$ -in. diameter by $1\frac{3}{8}$ -in. length, the center bearing $2\frac{1}{8}$ by 1 in., and the rear bearing $1\frac{1}{2}$ by $1\frac{1}{16}$ in. The valve mechanism on top of the engine is covered by an aluminum housing which is easily removable. Inlet and exhaust manifolds are iron castings.

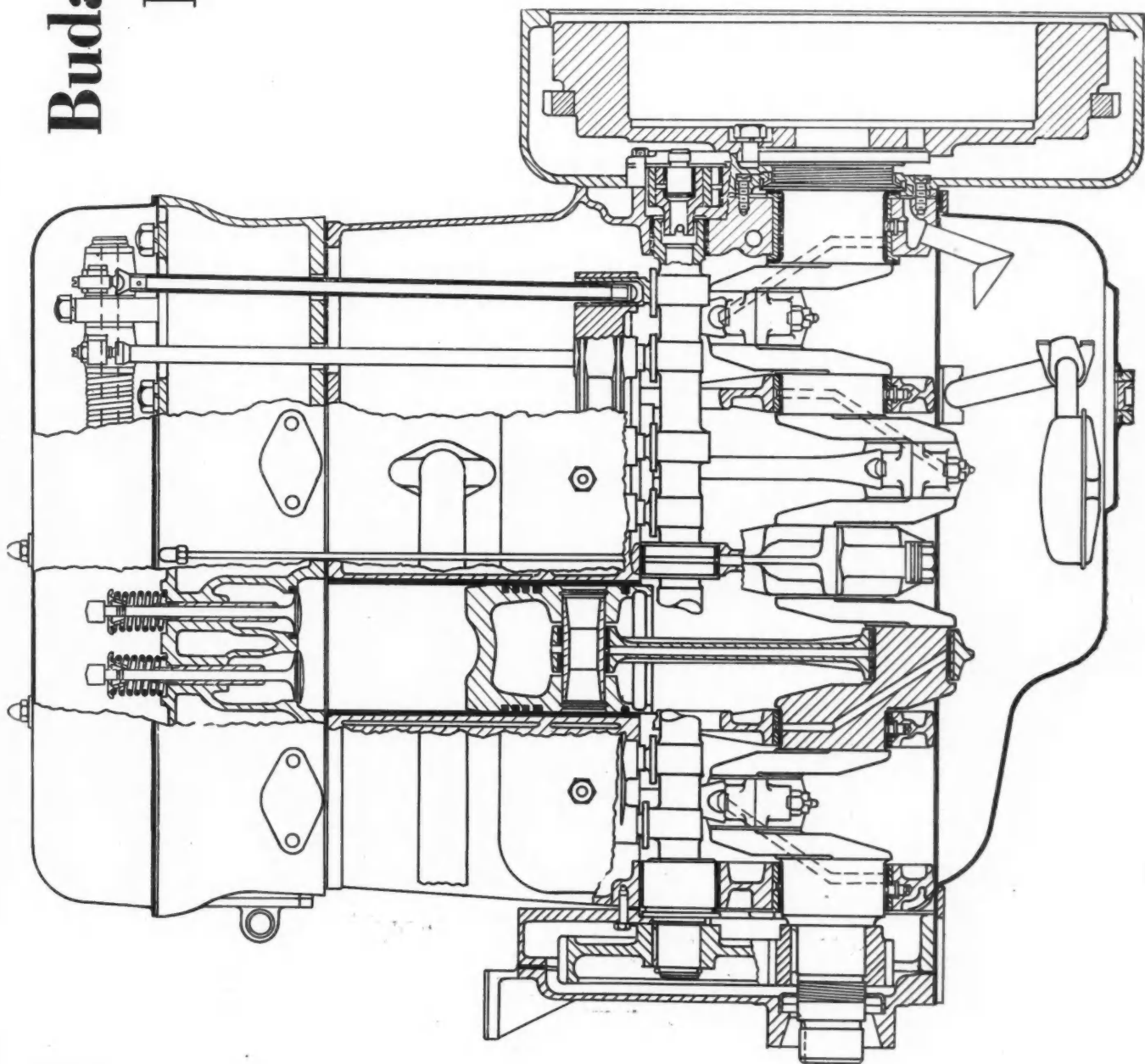
(Turn to page 246, please)



Buda Model 4-DT-196 Diesel engine, fuel pump side

Buda Model 4-DT-196 Diesel Engine

THIS small Diesel engine was specially designed for use in small trucks, tractors and power shovels. It is a four-cylinder engine of 3 $\frac{5}{8}$ -in. bore by 4 $\frac{3}{4}$ -in. stroke and has a displacement of 196 cu. in. Crankcase and cylinder block are in a single casting of chromenickel cast iron from which the "dry" cylinder liners can be easily removed. The crankshaft, which has five main bearings, is 3 in. in diameter. Connecting rods are 9 $\frac{1}{2}$ in. long between centers and big-end bearings are 2 $\frac{1}{8}$ in. in diameter. Main bearings are of the precision interchangeable type. Lubrication is by force feed to all main and connecting-rod bearings, to the valve rocker arms and timing gears. All lubricating oil passes through an oil cooler secured to the front of the cylinder head. The engine develops 21 hp. at 1000 r.p.m. and 42 hp. at 2000 r.p.m. The maximum torque of 110 lb.-ft. is developed at 1500 r.p.m. and corresponds to an output of 33 hp. The engine weighs 730 lb. without accessories and 885 lb. with accessories.

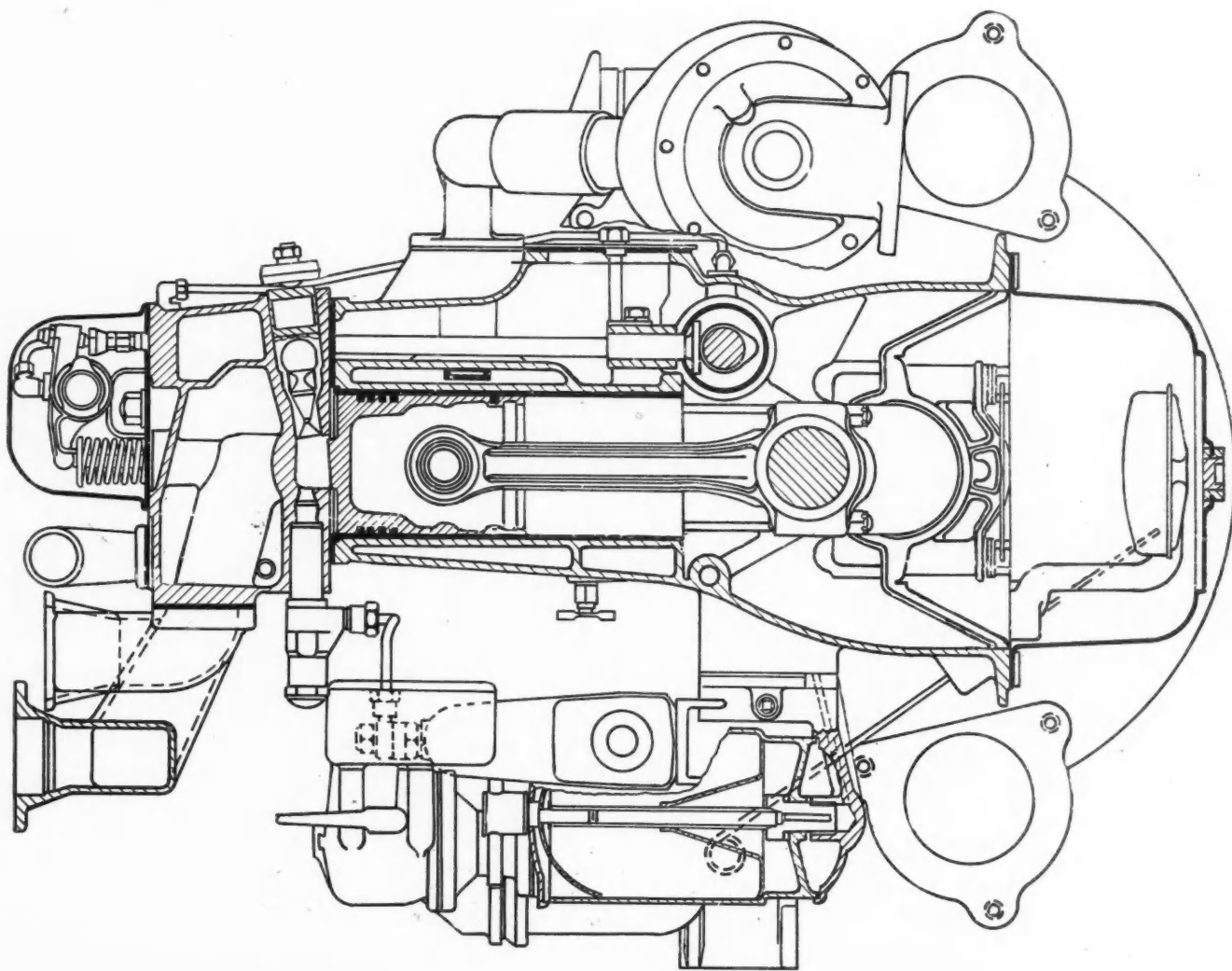


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Buda Model 4-DT-196 Diesel Engine

VALVES are located in the cylinder head of chrome-nickel steel and have port diameters of $1\frac{3}{8}$ in. for the inlet and $1\frac{1}{4}$ in. for the exhaust. The inlet valve is made of S.A.E. No. 3140 steel and the exhaust valve of 21-12 austenitic steel. Pistons are of aluminum alloy and are $6\frac{1}{32}$ in. long. They carry six rings each. A variable-speed governor is fitted which is driven from the fuel-pump drive shaft through helical gears. Fuel is injected by means of a constant-stroke injection pump with a unit for each cylinder, the amount of fuel injected being controlled automatically by means of the governor. The injectors are of the pintle type and the spray is parallel with the piston head so it does not strike the latter.

Scale 1:5.69±





a.c.f. Bus Has Underfloor Power



A Hall-Scott six-cylinder, horizontal engine of 106 hp. is governed to a maximum speed of 50 miles per hour.

THE a.c.f. Motor Co., Philadelphia, is introducing a new, smaller a.c.f. bus with underfloor powerplant, known as the Model 26-S, which has seating capacity for 26 passengers manufactured by the J. G. Brill Co. It is of the unit-structure or chassis-less type, the powerplant being hung from the frame of the bus body and the latter spring-supported directly on the axles without an intermediary chassis frame.

The body framework is composed of aluminum and steel members. The roof is of aluminum sheet, and has a paneled composition board ceiling. A composition board covering is used also for the floor, which is of laminated wood and is thoroughly sealed. Sash are of the lift type and are jacketed with stainless steel. Side sash at the rear is fixed, while the operator's sash pivots on a central axis. Side windows have flat-drawn sheet glass, rear windows shatter-proof sheet glass, and all glass is set in rubber and weather-stripped.

The windshield is of laminated plate glass, in two sections set in rubber channels, and is fixed. Aside from the obligatory emergency door at the rear, which is provided with a tell-tale light, the bus normally has only a single air-operated door, which is of metallic construction and has glass panels. A center exit door is offered as an extra.

As regards the interior finish, the ceiling and side panels are of composition board, while the frieze panels, post faces, and corner panels are of aluminum sheet. Interior paint work is in two colors. Passenger seats are of the transverse tubular type with single-deck spring cushions, with the rear of the back of metal (which assures maximum knee room), and stainless-metal

grabs. The operator's seat has a ventilated back and fore-and-aft adjustment. Upholstery is in machine-buffed leather. Rear settee and transverse seats have wood frames. There are chrome-plated steel stanchions back of the operator's seat and at the front-seat corner of the door. There is a curved hand rail extending from the stanchion at the front door to the side wall, while ahead of the front door there is a stanchion with a hand rail to the radiator housing. There is another stanchion at the center of the rear standing well. Ceiling grab rails are provided over the front longitudinal seats.

Interior lighting is by twelve 15-c.p. Brillite glareless fixtures. Headlamps have 21-c.p. bulbs and are provided with a foot-operated deflector

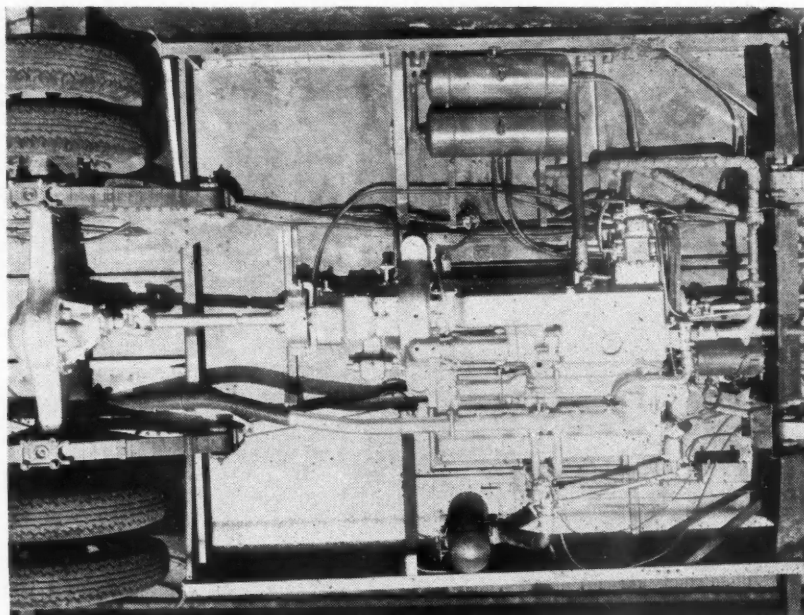
switch. Other lighting fixtures include one marker lamp at each front corner, with single lens showing both forward and to the side; two similar rear marker lamps, and a combination stop and tail light which is recessed into the rear of the body, the stop light being controlled by means of an air-operated switch and tell-tale light.

In cold weather heat for the interior of the bus is provided by the jacket heat of the engine. Air is drawn into the coach by a fan, through louvers in the belt rail and through the core of the heater unit, at the rate of 10 cu. ft. per minute per seated passenger. Air is exhausted through static ventilators in the roof at the forward end, this location being chosen to prevent the entry of air or exhaust fumes from outside. The hot water from the engine cooling system can be shut off from the heater unit by means of a valve, and fresh air from the outside can then be admitted and allowed to circulate through the interior, ventilation being promoted by the pivoted window at the driver's left and by a dash ventilator.

Fenders are of molded rubber. Front bumpers are of spring-steel and paint-finished, while rear bumpers are of the built-in type and provided with painted metal strips. Rub rails are of convex pressed steel and bolted to the body. There is a towing hook at the front end of the body.

Instruments mounted convenient for the driver include a speedometer, ammeter, oil-pressure gage, air-pressure gage, water-temperature gage, electric gasoline gage, throttle and choke controls. Other items of equipment include two Delco black-finished horns operated by a button on the steering column, two arc-type air-pressure windshield wipers with controls on the switch panel, one interior mirror, and one exterior rear-view mirror.

The powerplant consists of the Hall-Scott Model 95 six-cylinder horizontal engine with cylinder dimensions of 4 by 5 in. and a piston displacement of 377 cu. in. This engine, which is rubber-mounted amidships, has a rating of 106 hp. at 2600 r.p.m. All six cylinders of the engine are on one side of the crankshaft, which is claimed to facilitate service operations. The Zenith 1½-in. balanced-type carburetor is provided with an oil-wetted air cleaner. Electrical equipment is of Delco-Remy make and of the 12-volt type. A supply of 60 gallons of gasoline can be carried in the fuel tank, and fuel is delivered from the tank to the carburetor by means of



Under-floor view of the A.C.F. new model small bus

an electric pump with a fuel filter in the feed line. A fin-and-tube radiator is mounted in the front of the coach and is provided with automatic air-operated shutters. Cooling water is circulated by a centrifugal pump, and the radiator fan is driven by belt from an engine-driven shaft. Lubrication is by the pressure system, and the air compressor is lubricated from the engine system. An oil filter is provided.

The clutch is a Brown-Lipe single-plate of 13-in. diameter, with adjusting means. There are three forward speeds in the transmission, the low ratio being 4.01, the intermediate, 1.99, and the reverse ratio, 4.94. From the transmission the power is carried through a short tubular propeller shaft with two Spicer needle-bearing universal joints to the rear axle, which is a Timken product and is of the full-floating, bevel-gear-driven type, with a reduction ratio of 5-3/7. The front axle also is of Timken make.

Springs are of chrome-vanadium steel, front springs measuring 56 by 3 in., rear springs 58½ by 3 in. The steering gear is a Ross cam-and-lever type and is provided with a steering wheel of 20 in. diameter.

Service brakes act on all four wheels and are air-operated. The drums, which are of A.C.F. chrome-nickel iron, measure 14½ by 4 in., and the linings are ¾ in. thick. Auxiliary equipment in connection with the service brakes includes a Westinghouse 7½-cu. ft. compressor and Westinghouse brake valve chamber and slack adjusters. A propeller-shaft hand brake is located back of the transmission; it has a 9½-in.

drum and is applied by means of a lever convenient to the operator.

Single front tires of 9.00-18-in. size and dual rear tires of 7.50-20-in. size are standard equipment. Wheels are mounted on Timken roller bearings.

The weight of the coach ready for the road, with gas, oil and water, is 10,900 lbs. The wheelbase is 156½ in. and the overall width, 96 in. The turning radius is 26 ft.

As to the performance of the coach, it is governed to a maximum speed of 50 m.p.h. and its acceleration is such that a distance of 1,000 ft. can be covered from a standstill in 26 seconds.

Machine Tool Index Down

The index of machine tool orders prepared by the National Machine Tool Builders' Association, Cleveland, Ohio, indicates that the downward trend in volume of new orders placed persisted through January. At the end of the month the index, based upon reports of 133 companies was 118.4, an appreciable drop as compared with 142.7 for December and 200.3 for January a year ago.

Both domestic and foreign orders dropped below December in volume. Foreign business, however, held well within the higher range established in the last five months accounting for 63 per cent of the total new orders placed. As a matter of fact, foreign business continues to be the buoyant factor in holding the business for the industry above the average for the last five years, which for 1933 to 1937 inclusive, was 96.6.

Just Among Ourselves

World's Fair Is Going Automotive

THE New York World's Fair 1939 will have more automotive exhibits and be the focal point of more automotive activity than any similar event of which we have heard. Plans now in the making guarantee that everyone connected with the automotive industry will have reason to want to visit the fair sometime during its existence. Most of the specific plans are at too early a stage to discuss, but it's not too early to remind you that if you have any plans centering around the fair, either as an individual or an organization, it would be a good idea to start putting them into effect now.

It Will Take Team Work

IN view of the discussion which preceded setting Nov. 11 as the opening date for the next automobile show in New York, it is apparent that unless new model announcements by all companies are kept as close as possible to the opening date of the show, the dissatisfaction on this point which has been annoying automobile dealers will have new animus. From the standpoint of mechanical novelties in the cars themselves, the next show will probably have much more to offer than the last one. But if most of the cars are on dealers' floors for public display weeks in advance of the show opening, it will take a lot of the bloom off the show itself. The competitive advantage of an announcement ahead of the pack is undoubtedly weakened by the effect on the whole industry of an anti-climactic show.

SAE Membership On the Up and Up

THE 1938 *Roster* of the Society of Automotive Engineers issued this week reveals that the membership of the Society is at the highest point in the past five years. Still appreciably below the figures for the years 1928

to 1933, the membership has, during the past five years, shown a consistent growth, reflecting undoubtedly the constructive nature of the S.A.E.'s recent programs, quality of management, and an enviable financial position among all similar organizations throughout the world.

Automobiles Evaluated

CONSUMERS' RESEARCH, INC., celebrated St. Valentine's Day by mailing the 1938 edition of its annual *Automobile Number of Consumers' Research Bulletin*. Just thought we'd mention it in case you'd like to compare your private and confidential opinions of 1938 automobiles with the private and confidential opinions of Consumers' Research.

The Industry Loses A Great Man

THE death of Harvey Firestone removes from the congeries of industries called automotive a great individualist, one of the great two whose ideals were crowned with amazing financial success and endowed by the energies of their creators with a vitality which will carry them for many years.

With Henry Ford, his firm friend, chief customer, and favored companion of many years, Harvey Firestone can be said to have had a profound influence on the industrial philosophy of his times. So alike were the two men in many respects that in recent years it would have been difficult for a stranger, seeing pictures of both, to distinguish between them.

It has been maintained that when a man becomes great he is the resultant of the forces he has set in motion and the institutions he has created. In the beginning he is seen as a dot supporting an upended pyramid. Somewhere in the cycle the structure is reversed and the pyramid is said to support the dot.

Harvey Firestone's life and business philosophy went a long way to confute the latter view. To the end, Firestone the individual was the most important single factor in his organization. And he never forgot that a forest contains many kinds of trees, each worthy of individual care and attention. He, of few men, could see the trees and the forest, and give each its true value in the cosmos.

—H. H.

Buda Diesel Rated at 42 hp.

(Continued from page 240)

The flywheel is an iron casting and is secured to the flywheel flange of the crankshaft by means of five alloy-steel bolts and nuts.

Fuel injection is by a plunger pump with fixed length of stroke. The amount of fuel injected per cycle is controlled by a centrifugal governor which is driven through helical gears from the fuel-pump drive shaft. The engine may be governed at any speed from 400 to 2000 r.p.m. Nozzles are of the pintle self-cleaning type and are secured into the cylinder head in a horizontal position. With this arrangement there is no possibility of the spray striking the piston or cylinder walls. A fuel transfer pump of the plunger type is combined with the fuel injection pump and hand priming pump.

Lubricating oil is put under pressure by a gear-type pump driven from the rear end of the camshaft. The oil pressure is regulated by a spring-loaded by-pass valve which limits the pressure to 30-40 lb. per sq. in. All fuel and lubricating oil is thoroughly filtered before entering the engine, the filters being of ample size and accessible for cleaning. Cooling water is circulated by a centrifugal pump driven from the accessories drive shaft at crankshaft speed. The fan is driven by V belt from a pulley on the crankshaft.

Electrical equipment for use with this engine is of the 24-volt type, including a 24-volt generator with voltage control and a starter also wound for 24 volts.

Without accessories the engine weighs 730 lb. while with accessories it weighs 885 lb. The export shipping weight is 1200 lb.

An additional six-cylinder model of Diesel engine, the 6-DT-315, has also been announced by the Buda Co. It has a bore of $3\frac{3}{4}$ in., a stroke of $4\frac{3}{4}$ in. and a displacement of 315 cu. in. The normal output for automotive service is 83 hp. at 2400 r.p.m.

The 6-DT-315 is of the same design as other models of Buda Diesels. It is a "full Diesel" with solid injection and requires no glow plugs or other auxiliaries for starting. The "controlled-turbulence" combustion system is employed and is claimed to result in lower maximum combustion pressures.

The crankshaft is 3 in. in diameter and has seven wide bearings.

Connecting rods measure $9\frac{1}{2}$ in. between centers, and are rifle-drilled for pressure lubrication to the piston pin bearing. Timing gears have wide faces and are cut with helical teeth. Valves are of large diameter and exhaust-valve seats are replaceable.

Oil under pressure is supplied to all crankshaft bearings, connecting-rod bearings, piston-pin bearings, valve-rocker arms and timing gears. With accessories the engine weighs 1180 lb.

Chilton Roundtable

(Continued from page 230)

greater fuel pump capacity interests you, this department is informed that such a pump is in existence. An operative, who for years has been known for his caution, reports that he has seen the pump in operation on experimental cars and that it can be used either as a puller or pusher."

.... "There seems to be no end to progress. From a source this department has learned to rely upon comes word that one of the rubber companies now has a process for making pneumatic seat cushions and backs so that the air circulates and thus cools itself to a degree."

From MOTOR AGE

"Ab Jenkins will spend at least \$100,000 for a giant racer in which he hopes this summer to better the world land record of 311.42 m.p.h. set last November at Bonneville by Captain George E. T. Eyston. He said that his car would be somewhat smaller than Eyston's 'Thunderbolt.'"

"The trend toward smaller record cars is supported also by John Cobb, who is building a machine 'considerably smaller' than Eyston's mount. Neither Cobb nor Jenkins could say when they would make their record attempts. It was understood, however, that the three record drivers—Eyston, Cobb, and Jenkins—were planning for their assaults in the fall, probably September."

New Developments in Automotive Materials

(Continued from page 239)

ity of hard metal particles damaging gears and moving parts.

Wayne metal coating is supplied in the form of a very light jelly which may be applied by brushing, dipping or spraying. The product contains water and is said to instantly cool the hot welding sparks as they come into contact and prevent them from attaching themselves to the covered surfaces. Parts may be easily cleaned with hot water.

Mild Steel Arc Welding Electrode

A new mild steel arc welding electrode, designed especially for use with small alternating current transformer type arc welders, has been announced by the Lincoln Electric Co., Cleveland.

The new electrode, named Transweld, has a heavy extruded coating and the manufacturer claims that it has a very stable arc and is easy to strike and hold.

Weld metal produced by the electrode possesses high physical properties. Tensile strength is 75,000 to 85,000 lb. per sq. in., yield point 60,000 to 68,000 lb. per sq. in., and ductility 20 to 30 per cent elongation in 2 in.

Three sizes are offered: $3/32$ in., $1/8$ in., and $5/32$ in. The smaller size comes in 12-in. lengths, the other two in 14-in. lengths.

Scale of Standards For Surface Finishes

A scale of standards for surface finishes has been proposed by James Weaver, director of equipment, Westinghouse Electric and Manufacturing Co.

According to Mr. Weaver's proposed scheme, finish grades would be divided into 10 classifications, ranging from "0" for the roughest to "9" for the smoothest. "0" would designate a surface finish with an average depth of scratches, tool marks or serrations of 0.063 in.; "9" would designate a surface with scratches of approximately 0.000004 in. in depth. This is somewhat coarser than a finely lapped surface. Johansson gage blocks, for instance, have a standard of 0.000001 in. for surface marks.

Alignment Chart for Horsepower Correction

By L. MORGAN PORTER¹

THE accompanying chart makes possible the accurate and rapid determination of the brake-horsepower correction factor without resorting to slide-rule calculations for any conditions likely to be met in laboratory work. It is really two charts in one, serving as a solution of the familiar correction formula, and also as a solution of a modified correction formula allowing for humidity, assuming 75 per cent humidity as the standard condition. The latter formula has been used by various Government bureaus, the assumption of 75 per cent humidity as a standard being an arbitrary value.

A few examples will illustrate the use of the chart, taking first the usual correction formula

$$C.F. = \frac{29.92}{B} \sqrt{\frac{T}{520}}$$

where C.F. is the correction factor, B, the barometer reading, and T, absolute air temperature. Connecting the air temperature in deg. Fahr. on the right-hand scale with the observed barometric pressure in inches of Hg. on the left-hand scale by means of a straight edge, the correction factor is read at the intersection of this connecting line with the right-hand side of the middle scale, as shown by the following solutions:

Air Temp.	Barometer	C.F.
60	29.92	1.000
30	31.00	0.937
100	28.67	1.083

The extreme conditions of 28.67 in. Hg. barometric pressure and 100 deg. Fahr. air temperature were cited in a recent article by P. M. Heldt² as being the lowest pressure on record for Philadelphia and the highest temperature likely to be encountered in a testing laboratory. The combined effect of these two extremes gives a correction of 8.3 per cent to be added to the observed hp.

Taking the formula for 75 per cent humidity as the standard condition,

$$C.F. = \frac{29.53}{\text{Dry air pressure}} \sqrt{\frac{T}{520}}$$

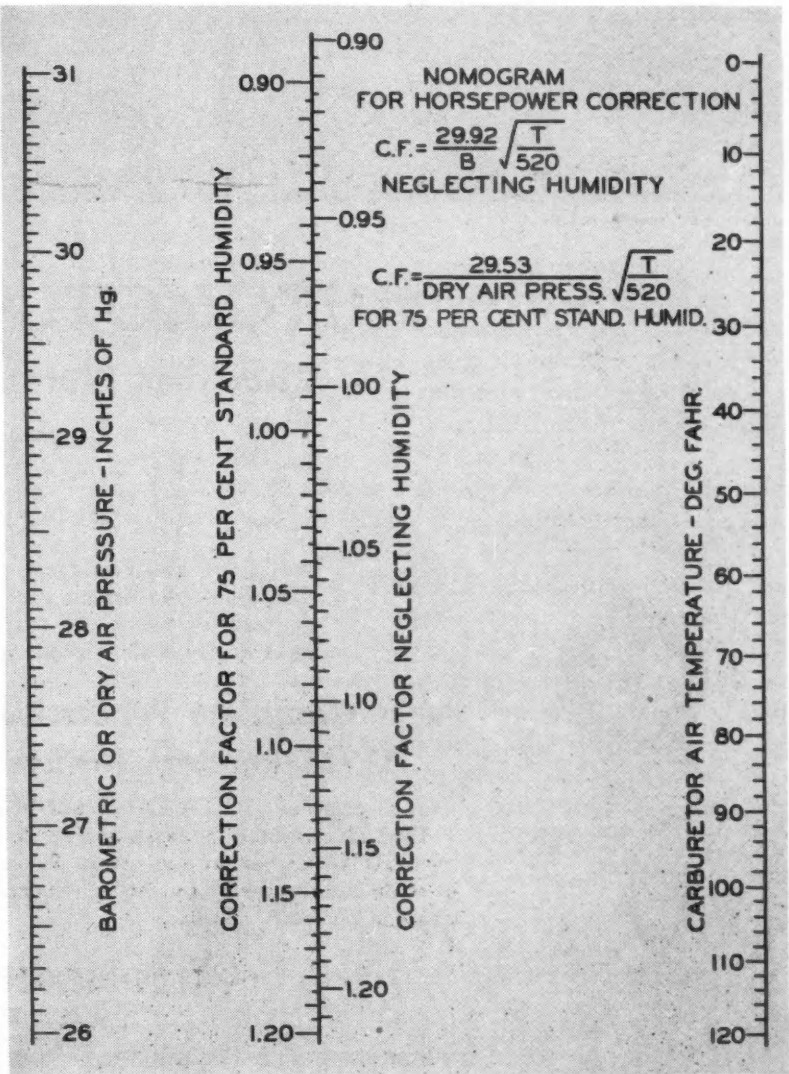
we proceed in a similar manner by

connecting the air temperature on the right-hand scale with the dry-air pressure in inches of Hg. (barometric pressure minus the vapor pressure) on the left-hand scale and reading the correction factor on the left-hand side of the middle scale. The constant 29.53 in the formula is the dry-air pressure existing with a barometer of 29.92 in. Hg. and 75 per cent humidity. In this case the vapor pressure is 0.39 in. Hg., giving us 29.92 - 0.39 or 29.53 in. Hg. as the dry-air pressure to be used in the numerator as representing standard conditions. It is to be noted that a similar formula may be written for any desired humidity, should it be desired to consider some value other than 75 per cent as being more representative of standard atmospheric conditions, by merely subtracting the vapor pressure for the

humidity in question from 29.92 and getting a new constant.

In this connection, should it be desired to consider standard conditions as 29.92 in. Hg. dry-air pressure, zero humidity, then corrections for observed humidity at the time of the test may be made on the chart by connecting the existing dry-air pressure on the left-hand scale with the proper air temperature and reading the correction factor on the right-hand side of the middle scale.

The effect of humidity on engine hp. has been investigated by Donald B. Brooks³ at the Bureau of Standards and it was found that the power varies directly at the dry-air pressure. Its effect under extreme conditions may be as large as the barometric correction alone, and, therefore, should not be overlooked.



¹ Asst. Prof. of Machine Design, New York University.

² AUTOMOTIVE INDUSTRIES, Nov. 20, 1937, page 750.

³ Research Paper 118, Bureau of Standards Journal of Research, Vol. 3, November, 1929.



Photograph by H. Armstrong Roberts

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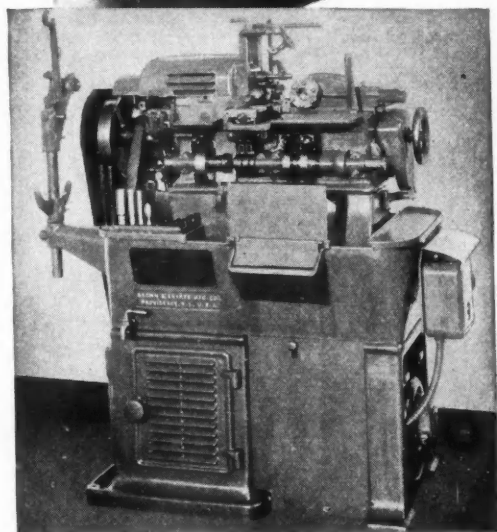
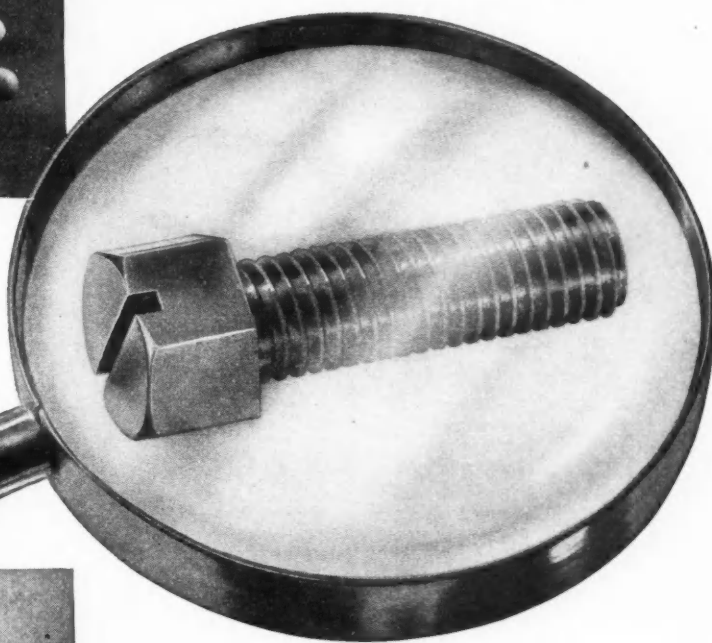
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